

Research Article

Antibiotic Resistant Pattern of Bacteria Isolated from Faecal Pellets of *Supella longipalpa* (Cockroach) Found in Akungba Akoko, Ondo State, Nigeria

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Abstract

The aims and objective of this research work centers on the assessment of antibiotics resistance pattern of bacteria present in the faecal droplet of *Supella longipalpa* (Cockroach) found in Akungba Akoko, Ondo State Nigeria. *Supella longipalpa* (Cockroach) Samples were isolated, total microscopy (enumeration), and re-identified (API kit) using serial dilution and standard microbiological method. Among the Bacteria isolated include both Gram positive and Gram negative bacteria, namely; *Pseudomonas aeruginosa*, *Bacillus cereus*, *Citrobacter spp*, *Corynebacterium spp*, *Klebsiella spp*, *Bacillus cereus*, *Escherichia coli* and *Enterobacter spp* others include *Salmonella typhi*, *Citrobacter freundii*, *Escherichia coli*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa*. The microbial load enumerated is between the range of 0.3×10^6 and 5.0×10^6 . Antibiotic susceptibility testing was carried out using the disk diffusion technique. Antibiotics used for the assay include gentamicin, ofloxacin, pefloxacin, augmentin, erythromycin, tetracycline, amoxicillin, cotrimazole, nitrofurantoin, ciprofloxacin, streptomycin. The resistance pattern in Gram negative bacteria revealed that most of the bacteria were resistant to Augmentin, Ceftriaxone, Nitrofurantoin, Amoxicillin and Cotrimoxazole, resistant to tetracycline, resistant to gentamycin, ciprofloxacin and ofloxacin. Gram positive bacteria were sensitive to streptomycin, cotrimoxazole, augmentin, tetracycline, cloxacilin, gentamycin, erythromycin and chloramphenicol. Conclusively, Vectors borne diseases remain one of the several recalcitrant plaques of human population. The surveillance and control were often overlooked. *Supella longipalpa* (Cockroach) were found as a commensal bacteria with multidrug resistant bacteria of significant public health issues, thereby propagating the transmission of the multiple resistant bacteria and imparting negatively on control measures in which disease outbreak is immanent.

Keywords: Antibiotic Resistant Pattern; *Supella longipalpa* (cockroach)

1. Introduction

The development of resistance to antibiotics in bacteria led to a discussion about the careful use of antimicrobial agents in the field of medicine [1], therefore, the main risk factor for an increase in bacterial resistance is an increased use of antibiotics. Antimicrobial agents are not used only for therapy and prevention of bacterial infections, but also as growth promoters. It is very important to monitor the resistance to antibiotics not only in human bacterial pathogens, but also in pathogenic and commensal bacteria of animal origin [2].

The emergence of bacterial resistance to antibiotics amongst pathogens generates prove of the potential post-antibiotic era which serves as a menace to present and future medical advances [3]. The bacteria that are mainly involved in the resistance process are the, so called the ESKAPE pathogens (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *enterobacteriaceae*) emphasizing their capacity to “escape” from common antibacterial treatments [3].

Development of antibiotic resistance among pathogenic bacteria is a public health issue, especially in the developing country like Nigeria, it can cause significant danger and suffering to individuals and entire community, who have common infections that once were easily treatable with antibiotics [4].

Supella longipalpa (Cockroaches) are insects, flattened from top to bottom, with two pairs of wings folded flat over the back. Most species rarely fly, but they can walk very fast. The colour is light brown or black. *Supella longipalpa* species vary from 2–3 mm. The egg case is 4–5 mm in length and contains about 16 eggs [5]. *Supella longipalpa* is one of the most notorious pests of premises, which not only contaminate food by leaving faecal droppings and bacteria that can cause food poisoning, but also they transmit pathogenic bacteria and fungi in infested areas [6].

Supella longipalpa are among the medically important pests in urban environments that cause serious ill-health problems. They have been found to harbour a number of potentially pathogenic bacteria which were carried either on the gut. The bacterial loads may be up to 14 million on the bodies, and 7 million in each of their faecal pellets. *Supella longipalpa* were considered to be a very important disease vectors transmitted by both mechanical and biological routes and they pose a concern in the hospital environment because they may serve as reservoirs for nosocomial infections which constitute a major public health challenges with serious economic consequences, which are exacerbated by antimicrobial resistance among the etiological microorganisms, in developing countries such as Nigeria, there have been concerns about the increasing *Supella longipalpa* populations in some hospitals [7].

Supella longipalpa (Cockroaches) can spread disease by contaminating human food with bacteria, they pick up in latrines, garbage dumps, etc. They may play a very important supplementary role in the spread diseases. They are

suspected carriers of the bacteria causing: diarrhea, dysentery, cholera, leprosy, typhoid, fever, viral diseases such as poliomyelitis [8].

2. Materials and Methods

2.1 Collection of Faecal Pellets of *Supella longipalpa* (Cockroach) samples

Faecal Pellets of *Supella longipalpa* (Cockroach) were aseptically collected from different location in Akungba-Akoko, Ondo State into sterile bottles and immediately transported to the Department of Microbiology laboratory of Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria.

2.2 Isolation of bacteria from the faecal pellets of *Supella longipalpa* (Cockroach)

Ten millilitres of the faecal Pellets of *Supella longipalpa* (Cockroach) sample were added to ninety millilitres of normal saline to make the initial dilution. This suspension was homogenized by gentle manual agitation and serially diluted from 10^{-1} to 10^{-7} . Isolation of bacteria was done using pour plate method on Nutrient medium using standard microbiological techniques. Bacterial cultures were incubated at temperatures ranging between 30 and 35°C for 1-2 days [9].

2.3. Enumeration of Bacteria count from the faecal pellets of *Supella longipalpa* (Cockroach)

Bacteria Counts were expressed in colony-forming unit per ml of sample. The isolates were sub-cultured repeatedly, until a pure culture isolates were observed. The pure culture isolates were transferred into a sterile nutrient agar in the McCartney bottles and kept in the refrigerator at 4°C as stock culture for subsequent tests [10].

2.4. Bacteria identification isolated from the faecal pellets of *Supella longipalpa* (Cockroach) samples

2.4.1 Pre-Identification of Isolated bacteria from the faecal pellets of *Supella longipalpa* (Cockroach) samples:

Bacteria colonies, shape, colour, size, edge, elevation and surface texture were observed and recorded after 18-24 hours of incubation. Subsequent streaking on solidified plates were done to characterization and Gram stain based on the morphological characteristics and biochemical characteristics of the isolates according to Bergey's Manual of Determinative Bacteriology [11].

2.4.2 Gram stain: Gram stain were done with a differential staining procedure used to distinguish bacterial cells based on their morphology, shape, and peptidoglycan components of their cell wall. A technique described by [11] were followed. The twenty four hours (24 h) old culture was used, by preparing a smear of the active bacteria culture (18-24 hours) on a grease free microscopic slide, Crystal violet (primary stain) were added to the smear which was decolorized after 1 minute with 70% acetone and rinsed off gently with distilled water after 1 minute. The smear were air dried; immersion oil was placed on the stained smear and view under the microscope using X 100 objectives. During gram staining, Crystal violet, which is the primary stain is firstly used, followed by Iodine which is the modern stain, Ethanol which is a decolorizing agent is also used, Safranin which is the counter stain is lastly and finally used. After each stain, distilled water is used in rinsing before adding another stain [11].

2.5. Biochemical test

2.5.1 Urease test: Dissolving the Christensen's Urea Agar (CUA) in 100 ml of distilled water and filter sterilized (0.45 mm pore size). The agar was suspended in 900ml of distilled water, which was boiled and allowed to dissolve completely. It was autoclaved at 121°C for 15 minutes where it was allowed to cool 54°C. 5 ml per tube was distributed (13 × 100 mm) and tubes were slant during the cooling before it solidified. The twenty four hour old culture organisms were streaked on the urea agar slant with apportion of well isolated inoculated slants with 1-2 drops, leaving the caps on loosely and incubated at 35-37°C for 48 hours 7 days. Positive results give a bright pink colour while negative showed no colour change [12].

2.5.2 Citrate test: The agar used in citrate test is Simmon's Citrate Agar. Citrate test is a test used to test an organism's ability to utilize citrate as a source of energy. The medium contains citrate as the sole carbon source and inorganic ammonium salts (NH₄HPO₄) as the source of nitrogen. It was done by dissolving the agar and gently heat with mixing and boiling until it dissolved. 5 ml was dispensed into various tubes and autoclaved at 121°C for 15 minutes. It was cooled and slanted before the fresh culture organisms were streaked with a light inoculum picked. It was then incubated aerobically at 35 to 37°C for 5 days. Positive results changes from green to intense blue along the slant, while negative results remain green [12].

2.5.3 Catalase test: This test was carried out by emulsifying a colony of bacteria in saline water on the slide, followed by the addition of hydrogen peroxide (H₂O₂) to the mixture. If the bacteria is catalase positive, bubbles of foam of air are observed [12].

2.5.4 Voges-Proskauer (V-P) Test : 0.6ml of 5% alpha-naphtol was added to 1 ml of 24 hrs broth culture of the different bacteria isolate in a clean test tube. Next, 0.2 ml of 40% potassium hydroxide was added to the mixture. The tube was gently shaken to expose the medium to atmospheric oxygen. After 15 minutes, a pink-red colour change was observed in the mixture, indicating a positive result [13].

2.5.5 Motility test: A clean grease-free cavity slide and cover slip were used. On the slide, a ring of plasticine 18 mm in diameter was made. A loopful of overnight broth culture of the organisms under test was placed on the centre of the cover slip ensuring that the drop of culture was in the center of the circle and did not come in contact with the slide. With a quick but careful movement, the slides were inserted such that the cover slips were uppermost. They were examined under the microscope using X10 and X40 objective. Motile organisms showed positive progression and specified directional motion, while non-motile do not [14].

2.5.6 Indole test: The broth culture of the test organisms in a test tube were inoculated with 3ml of trypton broth. It was incubated at 37°C for 24 hours. Then 0.5ml of Kovac's reagent was added to the broth. Positive result shows pink color ring, while a negative result shows no color change [15].

2.5.7 Sugar fermentation test: The sugars used for this test are glucose, lactose, sucrose, manitol and maltose. Different sugar broths were prepared and phenol red was added. The preparation involve mixture of 0.1% of sodium chloride (NaCl), 1 gram of the sugar and 0.01% of phenol red (indicator) in 100 ml of water, 5 ml of the broth were pipetted into test tubes in duplicates coupled with 5 ml nutrient agar broth. Durham's tubes were inserted in an inverted form to the mixture. The broths were sterilized using the autoclave at 121°C for 15 minutes and allowed to cool for 45°C. It was aseptically inoculated with pure colonies 24 hours at 37°C for 2-7 days after cooling. Change in colour, from red to yellow showed the presence of acid. Indication by displacement of air (CO₂) at the top of the durham's tube showed gaseous production [15].

2.5.8 Oxidase test: Bacteria which produce cytochrome oxidase have the capacity to oxidize Tetramethyl-p-phenylenediamine to indophenol. This test is carried out by placing 2-3 drops of Tetramethyl-p-phenylenediamine on a portion of filter paper, added to the visible amount of 18-24 hours old pure culture isolates of bacteria. A dark colour is observed the region of the mixture of the reagent and the pure colonies. This colour showed it is oxidase positive. It is oxidase negative if it doesn't produce any colour or produces colour apart from this [16].

2.5.9 Hydrogen sulphide production: A loopful test organism was inoculated into a test tube containing cysteine broth, covered with cotton wool. The cotton wool was removed from the test tube and the indicator paper strip was placed in its (test tube) mouth in such a way that the indicator paper strip lower end is above the medium but below the inner end of the cotton wool replaced to cover the test tube. The same procedure was done to an uninoculated broth (control). The inoculated broth was incubated for 3 to 5 days at 37°C. The result was observed and recorded. The production and liberation of hydrogen sulphide causes blackening of the lead acetate paper strip which is positive [15].

2.6. Bacteriological Analysis (Confirmation Assay of Identification Using API Method of Identification)

In order to determine and identify some of the bacteria using API, 1-3 cockroaches faecal pellet were randomly picked using forceps and transferred into sterile dilution bottles containing peptone water following aseptic techniques. This was then shaken vigorously by hand before appropriate aliquots were transferred into diluents. Further dilutions were made as deemed necessary. Nutrient agar was used for enumerating aerobic mesophilic bacteria; spore formers were cultivated on nutrient agar and enumerated after samples were heat treated for 8–10 min at 80°C [17].

2.6.1. USING API (For identification of bacterial): The API 20E strip (this strip is the same one used for the identification of *Enterobacteriaceae*) contains 20 microtubes with substrates for the following 23 tests: 0-nitrophenyl-fi-D-galactosidase (ONPG); arginine dihydrolase; lysine and ornithine decarboxylase; citrate utilization; hydrogen sulfide; urease; tryptophan deaminase; indole; Voges-Proskauer (acetoin); gelatin liquefaction; fermentation of the carbohydrates glucose, mannitol, inositol, sorbitol, rhamnose, sucrose, melibiose, amygdalin,

and arabinose; nitrate reduction and nitrogen gas production, tested in the glucose microtube; and catalase production, in any other carbohydrate microtube. The catalase test was not used in this study. A complete description of the strip is given in other reports [1, 5, 10, 12]. Additional media are required for the five separate tests not on the strip. Media for three of these tests are available from the manufacturer in snap-open ampules: API M for the motility test and API OF for both the glucose oxidation and glucose fermentation tests. Also available is the API oxidase test kit [17].

2.7. Antibiotic susceptible assay

The Bauer-Kirby procedure was performed on the identified isolates using the following antibiotic discs: for Gram positives- chloramphenicol, 25 µg; erythromycin, 5 µg; fusidic acid, 10 µg; methicillin, 10 µg; novobiocin, 5 µg; penicillin G, 1 unit; streptomycin, 10 µg; tetracycline, 10 µg; vancomycin, 30 µg; cefepime, 30 µg; cefprozil, 30 µg and for Gram negatives - ampicillin, 10 µg; cephalothin, 5 µg; colistin sulfate, 25 µg; gentamycin, 10 µg; streptomycin, 10 µg; tetracycline, 25 µg; sulphatriad, 200 µg; cefepime, 30 µg; cefprozil, 30 µg; and cotrimoxazole, 25 µg. Inhibition diameters were measured and interpreted according to manufacturer's recommendations (Mast Diagnostics,UK) [18].

3. Results

The bacterial population found in the faecal pellets of *Supella longipalpa* (Cockroach) varied according, as shown in Tables 1 has bacterial counts of $> 10^6$ CFU/cockroach, respectively. The bacterial population of $> 10^6$ CFU/cockroach from the toilets and household in Akungba-Akoko, Ondo State. Table 2 shows the morphological characteristics of all the bacteria isolated from faecal pellets of *Supella longipalpa* (Cockroach) which was collected from different sources, it shows characteristics such as the morphological colour, shape and the consistency among others. Table 3 shows the biochemical and morphological characteristics of bacteria. Different bacteria were isolated from the faecal pellets of *Supella longipalpa* (Cockroach). 10 genera were isolated and they include *Pseudomonas aeruginosa*, *Bacillus cereus*, *Citrobacter* spp, *Corynebacterium* spp, *Klebsiella* spp, *Bacillus cereus*, *Escherichia coli* and *Enterobacter* spp.

The following were further identified using API and they include *Salmonella typhi*, *Citrobacter freundii*, *Escherichia coli*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa*. Table 4 shows the bacteria identify using API kit, these organism were identified to spp level.

CODE	Location Collection	Bacteria count(10^5)
CO1	Akungba	5.0
CO2	Akungba	2.3
CO3	Akure	1.3
CO4	Akungba	4.1
CO5	Supare	0.3

CO6	Medoline	2.0
CO7	Akure	4.3
CO8	Ikare	1.9
CO9	Ikare	0.5
CO10	Supare	0.7

KEY- CO =Cockroaches

Table 1: Total Bacteria count (Enumeration) from the faecal pellets of *Supella longipalpa* (Cockroach).

Code	Pigment	Shape	Edge	Elevation	Surface	Consistency	Margin	Arrangement
CO1	Yellow	Circular	Smooth	Raised	Shining	Opaque	Circular	Clusters
CO2	Cream	Circular	Flat	Flat	Dull	Opaque	Irregular	Chains
CO3	Cream	Circular	Fimbrate	Flat	Smooth	Botyrous	Irregular	Chains
CO4	Green	Irregular	Smooth	Flat	Smooth	Opaque	Irregular	Singles
CO5	Cream	Circular	Frimbrate	Low convex	Smooth	Mucoid	Circular	Chains
CO6	Cream	Circular	Smooth	Flat	Smooth	Cocentrics	Circular	Chains
CO7	Cream	Circular	Fimbrate	Flat	Smooth	Botyrous	Irregular	Chains
CO8	Cream	Rod	Flat	Flat	Dull	Opaque	Irregular	Chains
CO9	Cream	Long rod	Fimbrate	Flat	Smooth	Botyrous	Irregular	Chains
C010	Yellow	Cocci	Smooth	Raised	Shining	Opaque	Circular	Cluster

Table 2: Morphological characteristics of bacterial isolates from Faecal pellet of cockroach (CO).

Isolates	Gram reaction	Shape	Spore staining	Catalase	Mofility	Nitrate production	Citrate	Indole production	Oxidase	Methyl red	V-P	Hydren sulphide	Urease	Glucose	Maltose	Mannitol	Sucrose	Lactose	Fructose	Probable identity
C1	+	Rod	+	+	+	+	+	-	-	-	+	+	-	+	+	-	+	-	+	<i>Bacillus cereus</i>
C2	+	Rod	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	<i>Staphylococcus aureus</i>
C3	+	Rod	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	<i>Staphylococcus aureus</i>

C4	+	Cocci	+	+	+	+	+	-	-	-	+	+	-	+	+	-	+	-	+	<i>Bacillus cereus</i>
C5	-	Rod	-	+	+	+	+	+	-	-	+	-	+	-	+	-	+	-	+	<i>Escherichia coli</i>
C6	-	Cocci	-	+	+	+	+	+	+	+	+	+	+	-	-	+	+	-	+	<i>Proteus vulgaris</i>
C7	-	Rod	-	+	-	+	+	-	-	-	+	-	+	+	+	-	+	-	+	<i>Klebsiella pneumonia</i>
C8	-	Rod	-	+	-	+	+	-	-	-	+	-	+	+	+	-	+	-	+	<i>Klebsiella pneumonia</i>
C9	-	Rod	-	+	+	-	+	-	-	+	-	+	-	-	-	+	+	-	+	<i>Salmonella typhi</i>
C10	-	Rod	-	+	+	+	+	+	-	-	+	-	+	-	+	-	+	-	+	<i>Escherichia coli</i>

Key: V-P= Voges-Proskauer (V-P) Test. + = Positive result; - = Negative result

Table 3: Biochemical characteristics of suspected bacteria in the faecal pellets of *Supella longipalpa* (Cockroach).

Isolate code	Percentage%	Identified organism
CO7	88.6	<i>Salmonella typhi</i>
CO8	90	<i>Citrobacter freundii</i>
CO9	92	<i>Escherichia coli</i>
CO10	79	<i>Klebsiella pneumonia</i>
CO6	85	<i>Pseudomonas aeruginosa</i>

KEY; CO =Cockroaches

Table 4: Confirmatory Identification of isolates (using API KIT).

CODE	OFL	CPX	GEN	PFX	AUG	COT	AMX	ERY	TET	AMX
CO1	17.0	0.0	10.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
CO2	14.0	12.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
CO3	17.0	12.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
CO4	20.0	15.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0
CO5	0.0	15.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0s	0.0
CO6	17.0	12.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0
CO7	17.0	17.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
CO8	15.0	12.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0
CO9	15.0	14.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
CO10	13.0	15.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0

KEY: 00- Resistant; CO=Cockroach Samplee; GEN=Gentamicin; OFL= Ofloxacin; PFX=Pefloxacin;
AUG=Augmentin; ERY=Erythr0mycin; TET=Tetracycline; AMO=Amocillin; COT=Cotrimazole

Table 5: Zones of inhibition of the antibiotics against the isolated coded bacteria isolates (Gram negative).

CODE	OFL	CPX	GEN	PEX	AUG	COT	AMX	NIT	TET	AMO
CO1	17	15	12	18	0	0	0	0	0	0
CO2	20	20	0	14	0	0	0	0	0	0
CO3	24	16	12	19	0	0	0	0	0	0
CO4	14	20	10	18	0	0	0	0	0	0
CO5	15	0	0	10	0	0	0	0	0	0
CO6	12	18	0	20	0	0	0	0	0	0
CO7	0	20	0	15	0	0	0	0	0	0
CO8	15	16	0	11	0	0	0	0	0	0
CO9	12	16	0	16	0	0	0	0	0	0
CO10	20	20	0	12	0	0	0	0	0	0

KEY: 0.0 - Resistant; CO=Cockroach Samplee; GEN=Gentamicin; OFL= Ofloxacin; PFX=Pefloxacin;
AUG=Augmentin; NIT=Nitrofurantoin; TET=Tetracycline; AMO=Amocillin

Table 6: Zones of inhibition of the antibiotics against the isolated coded bacteria isolates (Gram positive).

Several species of bacteria belonging to different genera which were isolated from the faecal pellets. Most of the bacterial isolates from the faecal pellets were 'Gram positive' and often spore formers. The exception to this was the presence of *E. coli* and other members of the family Enterobacteriaceae. Table 5 shows the activity of the Gram positive antibiotics against the coded bacteria isolates, Antimicrobial susceptibility assay of bacterial isolates to antimicrobials were observed. All the coded bacteria were resistant to most of the antibiotics, except for Pefloxacin, Ofloxacin, Ciprofloxacin and Gentamicin, with the zone of inhibition ranging between 10-20 mm. Table 6 Shows the activity of the Gram Negative antibiotics disc against the coded bacteria isolates, Antimicrobial susceptibility assay of bacterial isolates to antimicrobials were observed.. All the coded bacteria were resistant to most of the antibiotics, except for Pefloxacin, Ofloxacin, Ciprofloxacin and Gentamicin, with the zone of inhibition ranging between 11-24 mm.

4. Discussion

The rise in antibiotics resistance had been reported in the past two decades, and antibiotic resistance still remains a global problem today [19]. The incidence of bacterial resistance is a serious problem nowadays, application of antibiotics brings about an increase in resistance to antibiotics to pathogenic bacterial strains. Multidrug resistant bacteria may spread into the human population by direct contacts through food, animal source and insects like Cockroach [20]. As reported in table 3. The total microbial count enumerated was above the count reported by [24], which signifies that any total count above 1.0×10^6 is regarded as a microbial count capable of causing disease in human. In this research, bacterial pathogen were isolated from the faecal pellets of *Supella longipalpa* (Cockroach) which were mostly enteric bacteria and *Staphylococcus* spp, with *E. coli* having highest prevalence and reported by [21] and these pathogens are of public health importance. The detection of these bacteria this study agrees with the fact that the bacteria are part of the enteric flora of the *Supella longipalpa* (cockroach). High resistance to the multidrug Augmentin, Ceftriaxone, Nitrofurantoin, Amoxicillin, Tetracycline, Cotrimoxazole and Chloramphenicol were observed in all the isolates. This observation was consistent with previous reports made by [22] about multidrug-resistant bacteria isolated in faecal samples being multiple resistant.

Table 4 and 5 shows the distribution of isolated bacteria which are commonly enterobacteria such as *S. typhi* and *E. coli*. Most of the isolated bacteria were found to be resistant to Pefloxacin Augmentin, Nitrofurantoin, Tetracycline. Amocillin, Ampicillin, Caphalothin, Sulbactam/Ampicillin, Aztreonam and Chloramphenicol. However, some were sensitive to Gentamicin Ofloxacin, Ciprofloxacin, Sulfazotrin, Chloramphenicol, Ceftriaxon; and Sulbactam /Ampicillin [23]. Table 4 and 5 shows the distribution and frequency of enterobacteria in relation to antimicrobial susceptibility; 96.8% were found to be resistant to Gentamicin (80%), Ampicillin (75.3%), Caphalothin (66.7%), Sulbactam/ampicillin (50%), Chloramphenicol (30%). However, 100% were sensitive to cefepime and ciprofloxacin; Sulfazotrin (83%), Chloramphenicol (70%), Ceftriaxon (60.2%) and Sulbactam/ampicillin (33.3%). Also profile of antimicrobial susceptibility assay as shown in table 5 and 6, The isolated bacteria were resistant to Erythromycin, Pefloxacin, Tetracycline, Amocillin, Cotrimazole, Ofloxacin.

Ciprofloxacin and Gentamicin were sensitive to the enterobacteria strains evaluated in this study. These results can be associated with the efficacy of the antibiotics for the control of enterobacteria. Ciprofloxacin is one of the most powerful quinolones against Gram-negative bacteria, including methicillin-resistant and anaerobic staphylococci [25].

Table 4 shows the isolated bacteria that were identified using API(Active pharmaceutical ingredient). Isolates were identified even to species level, and the bacteria isolated were *Citrobacter freundii* and *Salmonella* species just to mention a few. These bacteria were also resistant to Amocillin and Augmentin There was 100% antimicrobial sensitivity to enterobacteria and resistant Ciprofloxacin, Gentamicin and Cefepime, which acts upon Gram-negative bacteria and also acts against Gram-positive enterobacteria. All the species were susceptible to cefepime. The results are in accordance with those found by [26] who found *Enterobacter* sp, *E. cloacae* and *E. Aerogenes* in the faecal pellets of *Supella longipalpa* (Cockroach) [27].

Sulbactam/ampicillin is clinically useful for the treatment of *Supella longipalpa* (Cockroach) related infection, due to the fact that Sulbactam/ampicillin can inhibit beta lactamase, this is also effective in the treatment of serious infections, such as respiratory, urinary tract infections and septicemia triggered by beta-lactamase-producing organisms. It acts against both Gram-positive bacteria (GPB) and Gram-negative bacteria (GNB) and resistance against it is acquired through plasmid transfer between enterobacteria and staphylococci which can be isolated from *Supella longipalpa* (Cockroach), However, it can also be predicted that 70% of the enterobacteria isolated from cockroaches were susceptible to chloramphenicol [28].

Ceftriaxon is a third-generation semi-synthetic cephalosporin that acts upon GPB (Gram positive bacteria) is not affected by beta-lactamase. however, there may be resistance in situations involving bacterial strains from *Supella longipalpa* that are resistant as a result of the non-hydrolytic barrier, impermeability mechanisms, modification of their action receptor or by penicillin-fixing proteins. The enterobacteria isolated from *Supella longipalpa* (Cockroach) were sensitive to ceftriaxon. Cephalexin and Gentamicin is a first-generation cephalosporin antibiotic that is characterized by bactericidal activity on GPB and GNB. They are resistant to staphylococci beta-lactamases and sensitivity to the beta-lactamases produced by GNB. However, the results of antimicrobial susceptibility assay during the course of this research work were in agreement [28] results presented in this study, since 75% of bacteria isolated from the cockroaches were resistant to cephalexin. It can be deduced that bacteria, such as *Enterobacter*, *Serratia* sp, *Citrobacter* sp and *Providencia* species were resistant to first- and second generation cephalosporins respectively [29]. Gentamicin is a broad-spectrum antibiotic that acts against GPB and GNB. Its main activity is against the latter, particularly enterobacteria. However, the enterobacteria isolated from the *Supella longipalpa* were relatively resistant to Gentamicin [30-34].

It is of utmost significance that healthcare givers should realize what the environmental requirements particularly those related to hygiene and cleaning services, pays special attention to the management of solid and liquid wastes [33]. The antimicrobial susceptibility profile of bacteria isolated from the *Supella longipalpa*, underlines the importance of developing infra-structure that complies with environmental sanitation its requirements and adequately monitoring of environmental facility especially in the communities that are inherent to the hygiene and cleaning services, a safe criteria should be defined with regard to the acquisition of medication, cleaning materials, and other products, controlling and optimizing food handling in the institution, standardizing the careful use of antimicrobials and the implementation of an integrated pest control program [35, 36]. The findings point to the need for further studies to be conducted with the purpose to design, implement and evaluate strategies to control insects and rodents, and cockroaches in particular, in health care institutions as regards infection control and prevention in order to provide a biologically safe environment.

5. Conclusion

Supella longipalpa carries a multi-resistant organism on their surfaces and on their faecal pellets. Their presence in homes compromises the best practices in food safety and quality. The bacteria carried by the cockroaches display multiple antibiotic resistances. Therefore, utmost care must be taken to drive *Supella longipalpa* out or by controlling their population at the household level. Being aware of the potential risk they carrying pathogens, toilet, kitchens must kept clean to avoid the scourge of *Supella longipalpa* infestation.

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