ASSESSMENT OF ANTIMICROBIAL ACTIVITIES OF *NIGELLA SATIVA* SEED EXTRACTS AGAINST CARBAPENEM-RESISTANT CLINICAL BACTERIAL ISOLATES

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ABSTRACT

Multiple drug resistant bacteria have become a public health threat by causing infections that are resistance to the antibiotics that are commonly used for their treatment. Therefore, there is the need to develop a safe and effective alternative to combat the infections caused by these multiple drug resistant bacteria. This study aimed at assessing the antimicrobial activities of three different extracts of *Nigella sativa* seed against carbapenem-resistant clinical bacterial isolates. Thirty-three (33) bacterial isolates from different clinical samples (blood, sputum, wound swab, ear swab, urine, stool, central line swab) used in this study were obtained from Microbiology diagnostic laboratory of Babcock University Teaching Hospital, Ilisan-remo, Ogun state. The isolates were subjected to morphological and biochemical tests for identity confirmation. Thirteen (13) selected carbapenem-resistant bacterial isolates were subjected to polymerase chain reaction (PCR) for amplification of genes encoding for carbapenemase (bla_{OXA-48}, bla_{NDM-1} and bla_{VIM}) in the isolates. The *N. sativa* seed extracts were obtained using three different solvents which were n-hexane, methanol and sterile distilled water using accelerated solvent extraction method. The crude extracts of the *N. sativa* seeds were subjected to qualitative phytochemical screening using standard methods. Gas-Chromatography Mass-Spectrophotometry (GC-MS) analysis was also carried out to identify major phytochemicals and fatty acids in the extracts. The antibiotic susceptibility tests and minimum inhibitory concentration (MIC) were determined using agar well diffusion and serial dilution methods, respectively. Data were analyzed using one-way analysis of variance with $P < 0.05$ considered statistically significant. The potency of the *N. sativa* extracts was assessed using molecular docking. From the thirty-three (33) tested isolates obtained, 54.5% (n=18) were resistant to one or more carbapenem antibiotics; 39.4% (n=13), 36.4% (n=12) and 45.5% (n=15) were resistant to imipenem, meropenem and ertapenem, respectively. From the PCR result, 61.5% of the isolates carried one or two of the carbapenemase genes. The aqueous extract of *N. sativa* seed

showed no zone of inhibition against the tested isolates. The n-hexane extract had zone of inhibition that ranged from 26 ± 3 mm to 6 ± 4 mm while the methanolic extract had zone of inhibition from 12 ± 4 mm to 6 ± 3 mm. The MIC ranged from 40 mg/mL to 120 mg/mL. The qualitative phytochemical screening indicated the presence of cardiac glycosides, steroids, phenols in all three extracts. Other phytochemicals present included alkaloids, saponins, terpenoids and flavonoids (methanol extract), tannins, alkaloids and terpernoids (n-hexane extract) and flavonoids (aqueous extract). The GC-MS analysis revealed the presence of different fatty acids which include 9,12-Octadecadienoic acid, Octadecanoic acid, Hexadecanoic acid, Cyclopropane,1,1-dichloro-2,2.3.3-tetramethyl, Methyl stearate, Propyleneglycol Monoleate and 11,13-Eicosadienoic acid. The GC-MS results when docked with the penicillin binding protein of the bacteria revealed Propyleneglycol Monoleate to have the highest binding negative energy. This study suggests that *Nigella sativa* seed extracts (methanol and n-hexane) possess antimicrobial activities against carbapenem resistant bacteria.