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Antibacterial activity of CuO and MgO nanoparticles in combination with levofloxacin against multidrug resistant *Escherichia coli* causing urinary tract infections

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ABSTRACT:

Metal nanoparticles (NPs), including oxides of magnesium and copper have been reported with antimicrobial properties. This study speaks about the antibacterial activity of the synthesized magnesium oxide (MgO) and copper oxide nanoparticles (CuO -NPs) against pathogenic *Escherichia coli* strain isolated from Urinary Tract Infection (UTI) patients. In the present study, 200 urine samples were collected and inoculated in sorbitol MacConkey medium to isolate a pure culture of *E. coli* O157:H7. Our results showed that *E. coli* was isolated from 60 (30%) of the total samples; 15 (7.5%) from male and 45 (22.5%) from female, which were inoculated in the MacConkey, eosin methyl blue and blood agar medium. The antibiotic sensitivity test showed that 75% of isolated *E. coli* showed multiple resistance to the tested antibiotics while 25% were sensitive to all antibiotics. The average crystallite size of tested MgO and CuO nanoparticles found to be 18 nm and 57.5 nm respectively using Debye Scherrer equation. MgO and CuO nanoparticles showed remarkable antibacterial activity against all isolated *E. coli*. MgO nanoparticles produced an inhibition zone ranged from (12.2±0.09 - 12±0.1) mm at 400 µg/mL concentration, while CuO nanoparticles produced an inhibition zone ranged from (10.2±0.5 - 9.5±0.21) mm in diameters at 220 µg/mL concentration. The antibacterial activity of levofloxacin combined with MgO at 400 µg/mL was significantly difference at $P<0.001$ in comparison to each of the antimicrobial compounds tested. Also, the Minimum Inhibitory Concentration MIC of CuO nanoparticles was 200 µg/mL. The bacterial inhibition zones were bigger when levofloxacin at 40,20,10 µg/mL were used in combination with CuO nanoparticle compared with using CuO nanoparticles or levofloxacin, separately.

Keywords:
Urinary tract infection, *E. coli*, Levofloxacin, MgO, CuO, Nanoparticles.

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