Abstract

Upper Respiratory Tract Infections (URTIs) affect the upper portion of the respiratory tract, including the nose, larynx, trachea, and pharynx. URTIs, such as tonsillitis, nasopharyngitis, otitis media, and pharyngitis, account for 87.5% of all respiratory infection cases. Various antibiotics are used to treat these respiratory tract infections. However, over time, the bacteria have developed resistance against these antibiotics. Furthermore, the medications used to treat URTIs might cause unwanted consequences in certain patients, including allergic responses and adverse consequences like rashes, diarrhea, and nausea. So, a cost-effective, eco-friendly, non-toxic, and safe approach to treating URTIs is required. Hence, nanotechnology has solved this issue. Metallic nanoparticles, being small in size, can treat upper respiratory tract infections by directly transporting antimicrobial drugs to the affected region. This approach reduces the severity of the infection, accelerates recovery, and minimizes the risk of systemic exposure and potential adverse effects. This study used a chemical approach to synthesize the stable silver doped Zinc oxide nanoparticles (Ag-ZnO NPs). The charge, shape, size, structure, and functional groups attached to the Ag/ZnO NPs were assessed using several characterization techniques, such as ZetaSizer/Zeta potential, Fourier Transform Infrared Spectroscopy, UV visible Spectroscopy, and X-ray diffraction. The synthesized nanoparticles were anionic with a crystallite size of 62.58 nm. Five different Multidrug-resistant (MDR) bacterial isolates, including *Pseudomonas sp., Klebsiella sp.,* Non-Lactose Fermenting bacteria (NLF), *Escherichia coli*, and *Streptococcus,* were used to test Ag/ZnO NPs' bactericidal activity. Ag-ZnO NPs exhibited significant bactericidal activity against various resistant bacterial isolates. Hence, these NPs can prove promising antibacterial agents after being incorporated into multiple formulations.