5. ABSTRACT

Three-dimensional (3D) printing for denture fabrication presents notable advantages, although denture-related stomatitis is a prevalent concern affecting 72% of wearers. Addressing this issue involves diminishing *Candida albicans* biofilm on dentures. While maintaining proper hygiene aids in mitigation, establishing an antifungal surface on dentures is important. A novel category of antimicrobial agents has emerged, offering a promising avenue to combat denture-associated stomatitis. Ionic liquids (ILs) are versatile organic salts with low melting points, comprising a cationic core such as an imidazole ring connected to a carbon chain and paired with an anionic counterion like chloride. This adaptability makes ILs a promising strategy against fungi. The diverse range of IL variations allows for exploration and optimization, including extending the alkyl chain length in the cation segment to enhance hydrophobicity and antimicrobial effectiveness. Incorporating an imidazole ring in this segment can also confer antifungal properties. Furthermore, in the anion segment, selecting highly hydrophobic structures like bis(trifluoromethylsulfonyl)imide (NTf_2) augments both hydrophobicity and antimicrobial attributes. This study aims to develop 3D printed resins for dentures with imidazolium-based ionic liquids and evaluate their physical, chemical, and biological properties. Four ILs with imidazole ring, different aliphatic chain lengths, combined by three different anions will be synthesized and characterized: 1-Butyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ($BMI.NTf_2$), 1-octyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ($OMI.NTf_2$), 1-butyl-3-methylimidazolium tetrafluoroborate ($BMI.BF_4$), and 3-(carboxymethyl)-1-methylimidazolium chloride (CMIM.Cl). The ILs will be incorporated into the resins at 0 (control group), 5, 10, or 15 wt.%. The resins will be tested for flexural strength, Knoop hardness, roughness, color, thermogravimetric properties, cytotoxicity, and antifungal activity via colony-forming units assay, XTT assay, confocal microscopy with live/dead biofilm staining, and scanning electron microscopy. This project has the potential to pave the way for advancements in materials science, leading to the development of an innovative therapy to improve healthcare outcomes significantly.