ABSTRACT

In 2020, breast cancer incidence in Indonesian women had become the highest among other cancers. There are different approaches to combat this disease; one of them is immunotherapy which focuses on utilizing the body's immune cells to eliminate and evoke an immune response against cancer. This study aims to develop a multi-epitope peptide-based vaccine targeting Mucin 1 (MUC-1) and Matrix Metalloproteinase 9 (MMP-9), which are overexpressed in breast cancer, for the Indonesian population using immunoinformatics tools. The NetCTLpan and NetMHCIIpan were utilized to find the cytotoxic T cell and helper T cell epitopes, respectively. The B cell epitopes were predicted using Linear Bepipred 1.0, Emini's surface accessibility, and Kolaskar and Tongaonkar antigenicity methods available in IEDB. The selected epitopes fulfilling criteria such as immunogenic, able to induce IFNγ, and promiscuous for the T cells and predicted in three methods for B cells were assembled using Heparin-Binding Hemagglutinin Adhesin (HBHA) as the adjuvant and linkers. Other evaluations of vaccine construct to determine its efficacy and safety were also performed. The final vaccine design was antigenic, non-allergenic, stable, not likely to induce autoimmunity and disrupt the gut microbiomes homeostasis, able to cover the vast majority of the Indonesian population, and able to induce immune responses. The docking simulations showed that the vaccine construct could bind with TLR4, and ^{1040}SFFFLSFHI^{1049} peptide was able to bind with both HLA-A*24:07 and HLA-A*24:02. Even though the vaccine construct seems promising, further studies are needed to confirm the results of this study.

Keywords: vaccine, immunoinformatics, breast cancer, Mucin-1 (MUC-1), Matrix Metalloproteinase-9 (MMP-9)