ISSN: 1391-8796
Proceedings of 9th Ruhuna International Science & Technology Conference
University of Ruhuna, Matara, Sri Lanka
January 19, 2022

Non-Newtonian blood flow in an artery vessel under non-ionizing magnetic fields in chemotherapy

Tharindi G.P.S.* and Karunathilaka N.G.A.
Department of Mathematics, University of Kelaniya, Kelaniya, Sri Lanka.

The treatment processes of breast and other different non-skin cancers involve combinations of surgery, chemotherapy, and ionizing radiation. Radiation or surgery targets a specific area of the body. However, chemo can work throughout of the body. Even though both chemotherapy and ionizing radiation can be effectively used against many types of cancers, these treatment processes may harm to healthy tissues, too. To minimize the damages, cause through chemotherapy nonionizing magnetic fields has been proposed and examined. Because of promising results many scientists have paid their attention to this research area. In this work, we develop a Mathematical model for the description of the dynamics of the steady blood flow in arteries under chemotherapy. We consider blood flow in arteries filled with homogeneous porous medium under external magnetic force with constant permeability and variable permeability. Herschel-Bulkley and Casson fluid flow models were used to describe non-Newtonian behavior of the blood flow. An iterative method was used to obtain the shear stress under constant and variable permeability. The velocity profile and flow rate also approximated in two different fluid models. Change of the shear stress with the radial distance was observed for constant and variable permeability. These two situations were compared in two different fluid models for different flow parameters. We observed that the shear stress was increasing with the increase in radial distance and permeability factor in both situations. Furthermore, in both cases the plug core radius increases with the increase of the yield stress. In both fluid models, velocity increases with the increase of the constant permeability factor. In the absence of some exact parameter values, test values were used for the simulation purposes in MATLAB (R2018a). Hence, the study describes only the qualitative behavior of flow variables. Exact values could be used to describe the flow variables quantitatively.

Keywords: Casson fluid, Constant permeability, Herschel-Bulkley fluid, Magnetic force, Variable permeability

*Corresponding author: pathiranage581@gmail.com