

Peristaltic flow of a Jeffrey fluid under the effect of radially varying magnetic field in a tube with an endoscope

ABSTRACT

The influence of an endoscope on peristaltic flow of a Jeffrey fluid through the cylindrical cavity between concentric tubes with variable magnetic field has been investigated. The governing equations of two dimensional fluid have been simplified under the consideration of long wavelength and low Reynolds number approximation. Exact analytical calculations are carried out for the pressure gradient, velocity, pressure rise, friction force on the inner and outer tubes and shear stress. The effect of the non-dimensional wave amplitude, the variable magnetic field, the ratio of relaxation of retardation time, the radius ratio and the non-dimensional volume flow are analyzed theoretically and computed numerically. Comparison was made with the results obtained in the presence and absence of variable magnetic field and an endoscope. The results indicate that the effect of the non-dimensional wave amplitude, variable magnetic field, ratio of relaxation to retardation time, radius ratio and non-dimensional volume flow on peristaltic flow are very pronounced.

Keyword: Peristaltic flow; Jeffrey fluid; Sinusoidal wave; Coaxial uniform tubes; Variable magnetic field; An endoscope