Analysis of wall shear stress of stenosis affected artery by mathematical modeling and simulation

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Stenosis indicates a disease in which blood vessel becomes narrow due to development of arteriosclerotic plaques or other type of irregular tissues and due to suspension of cholesterol, carbohydrates, fibrous tissues, inhaled particles and fats in the lumen [3] which develops inward into the lumen of the artery and inhibit the natural blood flow. The study of suspension flow of small particles in a viscous fluid through constricted vessels have considerable significance in medical, industrial and physiological field [1]. Lee et al. [2] obtained numerical solutions of steady pulsatile flow through axial symmetric rigid stenoses by considering blood as a Newtonian fluid. Therefore, the aim of this paper is to investigate the incompressible boundary layer pulsatile flow of nonspherical nano particles, suspended in a Newtonian fluid through a cylindrical tube whose wall is permeable and bounded by axisymmetric constrictions. Fluid flow is governed by a two dimensional Navier-Stokes equations with Darcy-Forchheimer drag caused by non-Darcian effect and governing equations are solved numerically by using finite difference scheme. Results indicate that the wall shear stress increases when flow of nonspherical nano particles through highly permeable wall with axisymmetry stenosis is taken under consideration.

References

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