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ORIGINAL PAPER

A New Method for Studying Blood Flow Through a Stenotic Artery in the Presence of a Magnetic Field

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Abstract
In this study, a new approach is proposed to study blood flow through a stenotic artery under the impact of a magnetic field. The new approach depends on the Chebyshev series, the Akbari-Ganji method, and the new homotopy perturbation method named the Chebyshev Akbari-Ganji homotopy perturbation method (CAGHPM). The validity of the proposed method was ensured through small errors and excellent convergence compared to other methods, in addition to the good agreement of its results with the results obtained by other methods mentioned in previous studies. The influences of the inclination angle, magnetic field, porosity, and chemical reaction on the velocity, temperature, wall shear stress, and concentration of blood flow are discussed. The results obtained by using CAGHPM are more accurate than other methods used to solve the current problem. Moreover, error tables, figures, and convergence analysis theoretically and computationally show the efficiency and effectiveness of the proposed new method.

Keywords Homotopy perturbation method · Chebyshev series · Non-Newtonian fluid · Blood flow · Heat transfer · Nonlinear equations · Convergence analysis

Introduction

The excessive consumption of sugars and fats, coupled with a sedentary lifestyle, results in the accumulation of these substances within the walls of the internal vessels. Over time, this phenomenon gives rise to atherosclerosis a condition characterized by the narrowing and hardening of vessels. The restricted spaces within the arteries impede the proper circulation of blood, leading to inadequate delivery of oxygen and nutrients to various tissues. Commonly, blood perfusion disorders manifest in vessels supplying the heart and the brain. The arterial constriction reduces blood flow to vital organs, giving rise to severe consequences such as heart attacks, strokes, and even death.

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