Effect of elasticity on two-layered peristaltic flow of non - Newtonian fluid in a channel

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INTRODUCTION

Extensive study has been done on the peristaltic flow of Newtonian fluids that are propagating through the channels or tubes in order to get a better understanding of the process that is responsible for the flow of fluids in organisms. The majority of living things exhibit this kind of fluid movement such as transport of chyme in small intestine, swallowing food via oesophagus, vasomotion of blood in vessels, etc. The first experimental study on peristaltic flow was carried out by (Latham, 1966). In continuation to this, Shapiro et al. (1969) have carried out the hypothetical and experimental studies on the peristaltic flow of fluids in different conditions and observed results were clearly explained using different physical models. Yin and Fung (1971) carried out the hypothetical studies on peristaltic flow of fluids and the results were proved experimentally. The fluids with elastic behavior are important and will be helpful to understand the behaviors of arteries and small blood vessels as these fluids are elastic in nature. Shukla et al. (1980) have carried out intensive studies on physiological fluids and the studied the influence of viscosity at peripheral region on peristaltic flow of the fluids. Brasseur et al. (1987) explored his results on peristaltic movement of fluids in core and peripheral layers. The lubrication approach was used by Sochi (2014) in order to analyze flow characteristics of both Newtonian and Powerlaw fluids as they move through elastic tubes. Tripathi and Sharma (2020) have investigated the role of joule heating effect and viscous dissipation of blood flow" by considering two layered model and here the fluid flow is happening through a stenosed artery and it is subjected by an external magnetic effect. Sreenadh et al. (2021) investigated the impact of elasticity on the flow behavior of dual layers of non-Newtonian fluid within a tube.

RESULTS & HIGHLIGHTS OF IMPORTANT POINTS

This article studies the influence of elasticity on two-layered peristaltic flow in a channel. The two dimensional channel flow is considered with two regions as core and peripheral. The proposed two-layered model assumes that the core region is governed by the Jeffrey model, while the peripheral region is described by the Newtonian model. The channel walls are flexible and the problem is formulated under the assumptions of long wave length and low Reynolds number approximations. The expressions for axial velocity and flux are obtained. The expressions for stream function in both peripheral and core regions are derived and presented. Interface is the interesting phenomenon in multi-phase flows. The equation for interface is obtained and explained through graphs. It is observed that the flux increases as the elastic parameters increase. The flux as a function of inlet pressure decreases as outlet pressure decreases, but the opposite behavior is observed for increasing inlet pressure values. The results noticed in present flow characteristics shows many interesting behaviors that guarantee the further study of physiological fluids in mufti phase channels in the presence of elasticity.

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