

ANALYSIS OF NEWTONIAN AND NON-NEWTONIAN BLOOD FLOW THROUGH MULTIPLE STENOSES IN NARROW ARTERY

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Abstract: This study presents a mathematical model aimed at investigating the effect of blood flow parameters in a narrow artery with multiple stenoses. Blood is modelled as a non-Newtonian Kuang-Luo (K-L) fluid. Numerical expressions for blood flow characteristics including blood flow rate, skin friction and resistance to blood flow have been derived. These expressions have been solved using MATLAB R2022a software and analysed graphically. The flow properties exhibit distinct behaviours in response to changes in plasma viscosity and yield stress. Furthermore, it was noted that variation in skin friction is more pronounced in Newtonian fluid compared to non-Newtonian K-L fluid. Additionally, the effect of yield stress on all flow quantities is comparatively lesser than that of plasma viscosity. The findings of this study have been validated against existing models.

Keywords and Phrases: K-L fluid model, narrow artery, blood flow, multiple stenoses.

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1. Introduction

Cardiovascular diseases such as coronary arterial disease, cerebrovascular disease and peripheral artery disease are among the deadliest diseases worldwide. These diseases occurs as a result of blockage in one or multiple arteries, leading to restricted blood flow to the brain or heart. Stenosis is a condition characterised