**Incorporation of concentration gradient of blood nutrients in ESR fractional model with non-zero uniform average blood velocity**

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**Abstract**

A new insight is presented into the solution of ESR mathematical model, based on fractional derivative with respect to time, with non-zero uniform velocity of blood by incorporating the concentration gradient of the blood nutrients. An analytical solution is acquired for the modified ESR fractional model in addition to presenting some new interesting results. The best possible suitable range is found for the concentration gradient for the model whose use will be helpful in approximating the clinical data from laboratory test in a profound and accurate manner, and also in diagnosing the ESR rate more accurately. Further, an appropriate range is proposed for the uniform velocity of blood as well as the fractional order of the differential equation to construct a feasible model. Validation and verification of the obtained results against earlier results demonstrate the effectiveness of the proposed model.

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