Abstract

Diabetes Mellitus is a chronic illness that requires continuing medical care and ongoing patient self-management education and support to prevent acute complications and to reduce the risk of long-term complications. Diabetes Mellitus care is complex and requires that many issues, beyond glycemic control, be addressed. A large body of evidence exists from American Diabetes Association on diagnostic, classification and screening that supports a range of interventions to improve Diabetes Mellitus outcomes. So far the models developed for blood glucose regulatory system (BGRS) during drug therapy in patients with Diabetes mellitus are based on glucose and insulin only. This study presents a new Mathematical Model for Drug Therapy in Patients with Diabetes Mellitus which includes external rate at which blood glucose, insulin and epinephrine are being increased in the form, $\dot{\mathbf{Y}} = A\mathbf{Y} + \vec{r}(t)$ and whose solution was analyzed to provide the systems natural frequency, ω_0, which is the basic descriptor of saturation level of the drug. It was established that the resonance period for the final model, that is, $T_0 = 3.76912$ hrs, is in the acceptable therapeutic range and agrees well with the data for the existing insulin therapy. By employing the model, it is shown that, the peak, which is the time period for insulin to be most effective in lowering blood sugar, is shorter than $T_0 = 5.3199$ hrs, for the existing model. This model would help the medical practitioners to predict drug therapy in patients with Diabetes Mellitus, in such a way that the concentration of the drug remains in the therapeutic range.