

17TH GLOBAL DIABETES CONFERENCE & NURSING CARE

March 08-09, 2018 | Paris, France

Investigation of synergistic actions of vitamin D on metformin and insulin in patients with diabetes mellitus type 2: A combined experimental and computational study to control diabetes

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Statement of the Problem: One of the most worldwide health problems, which is a disorder in glucose metabolism and causes diverse dangerous symptoms, is diabetes mellitus (DM). Two types, diabetes mellitus type 1 (T1DM) and diabetes mellitus type 2 (T2DM) are the major forms of DM. In 2013, it has been estimated that 382 million people had DM. Among them, about 90% cases were T2 DM.

Methodology & Theoretical Orientation: In the current study, at first, interventional and experimental studies on 45 patients with T2DM were occupied and the effects of restricted diet, metformin and insulin in the absence or presence of vitamin D were evaluated on certain blood biochemical parameters. Also, molecular dynamics (MD), molecular docking and MM/PBSA were employed to analyze the flexibility of vitamin D receptor (VDR), in free or ligand bound form, during 50 ns.

Findings: Experimental data showed that the combination of metformin/ vitamin D or insulin/ vitamin D treatments can decrease the fasting blood glucose. Vitamin D alone or in combination with insulin or metformin decreases the LDL and cholesterol of patient's serums. Vitamin D along with insulin decreases the insulin resistance and increases the insulin sensitivity in patients with T2DM. Glut 4, which is not detected in the lymphocyte of healthy people or patients with T1DM, was found in the patient's peripheral lymphocytes. The MD results showed that in the presence of metformin, the flexibility of helix 12 residues from vitamin D bound VDR were decreased. Also, metformin decreased the radius of gyration of agonist bound VDR. However, metformin has no effect on the binding free energy between VDR and vitamin D.

Conclusion & Significance: Our data showed that metformin, in the presence of vitamin D could stimulate the interaction between VDR and co-activator receptor.

Biography

Sako Mirzaie has PhD in biochemistry and a faculty member of Azad University of Sanandaj. He has more than 24 papers in international journals. He is expert in molecular modeling, protein engineering and enzyme kinetic assay. In his new research, he is looking for the new formulation for increased stability of insulin in certain intelligent implant.

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