SUMMARY

7.0 Summary :

Diabetes mellitus is a chronic disease characterised by hyperglycemia and glucosuria. The major forms of diabetes result from defects of insulin secretion, insulin action or both. It is associated with long-term damage, dysfunction or failure of various organs especially the eyes, kidneys, nerves, heart and blood vessels.

Incidence rates of diabetes varies widely in different countries, with a high incidence in Scandinavia and Sardinia and a low incidence in Japan and China. However, in India data suggest the incidence rate 10.5/1,00,000/year.

The mainstay of treatment of diabetes is done by lowering the level of blood sugar through diet control, use of oral hypoglycaemic drugs and insulin injection. All have their limitations and long term complications and many fail to control the adverse effects of diabetes on different systems of the body.

Research on antioxidant leads to the identification of selenium as a potent oxygen free radical scavenger. Linkage of data showing relationship between selenium in soil and pancreatic cancer gave the idea of possible association of selenium in pancreas related disease like diabetes. Vanadium also showed an insulinomimetic action. Our study on selenium also showed the normoglycaemic action of this element on the experimentally induced diabetic mice by intraperitonial injection of streptozotocin. Selenium in the dose of 0.05 micro gm/0.1 ml had the best hypoglycaemic action.

The following are the major highlights of the effects of selenium on different biochemical pathways while producing hypoglycaemia in diabetic mice.

With respect to carbohydrate metabolism, the levels of glucose-6-phosphatase, glucose-6-phosphate dehydrogenase, succinic dehydrogenase, pyruvic acid, glycogen, lactic acid were brought to or near normal value on treatment with selenium in streptozotocin induced diabetic mice. Only exception in case of lactate dehydrogenase in serum, the level went on rising on selenium treatment both in normal and diabetic groups.

With respect to lipid metabolism, the levels of cholesterol, LDL, VLDL, HDL, triglyceride, HMG-CoA reductase were almost normalised on selenium feeding in experimentally induced diabetic mice. In vanadium fed groups the serum triglyceride level was much higher than the normal value.

In the groups of experiments related to detoxicating microsomal enzymes the levels of glutathione and glutathione reductase were normalised in selenium treated experimentally induced

diabetic groups. But the levels of glutathione-s-transferase and UDP-glucoronyl transferase went on rising on selenium feeding in streptozotocin induced diabetic mice.

In the group of peroxidation reactions the levels of lipid peroxidation came to normal in selenium fed diabetic group. In the lipid peroxidation level in liver in both selenium and vanadium fed diabetic mice the levels were normalised. Catalase showed no effect on selenium feeding. Cyt-P-450 level was halved in selenium treated experimentally induced diabetic mice. In case of fibrinogen the level rose almost 3 times in diabetic group and with selenium treatment the level fell but remain more than twice the normal value. In monoamine oxidase the level was almost normalised in selenium fed diabetic group. The level of acetyl choline esterase in brain in diabetic group fell by 13 times. With selenium feeding the level rose more than 3 times the diabetic level. In blood urea the level rose more than twice the normal value in selenium treated expeirmentally induced diabetic group.

The selenium content in pancreas was increased by more than 10 times the normal value on production of experimental diabetes.

Chromosome preparation showed no change in normal, diabetic and Selenium Dose2 fed diabetic groups.

In histopathology of pancreas, streptozotocin treatment showed destruction of pancreatic islet cells. On selenium feeding there was no change of islet cells.

Thus it can be concluded that the activity of the enzymes lactate dehydrogenase, glutathione-s-transferase, UDP-glucoronyl transferase and the levels of fibrinogen, urea rose more in the selenium fed group than the normal and diabetic groups.

The activity of the enzyme acetyl choline esterase and the level of Cyt-P-450 monoxygenase fell in the selenium treated group. Lipid metabolism showed complete normalisation with selenium treatment.

It is seen that although selenium normalises the blood sugar level in the diabetic mice still it is not a complete substitute of insulin. To replace insulin some other compound may be added with selenium or the salt of selenium may be changed, like in the lipid peroxidation in liver addition of vanadium with selenium to diabetic animals normalised the blood sugar level. This hypothesis needs further investigations.

However, the mode of action of selenium on cellular level is a place of future research. The receptor locking activity and effect on the messengers for introduction of glucose inside cell is the field for further research.