Endocrinology Congress 2016: Association of fasting insulin with plasma, RBC micronutrients copper and zinc in newly diagnosed type 2 diabetic patients

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Microminerals like Copper and Zinc are extremely important trace elements as involved in a number of metabolic processes though required less than 100 mg/day. So imbalance of trace elements may be the consequence of metabolic disorders. Trace elements act as essential co-factors of enzymes as well as organizers of the molecular structures of the cells (e.g., mitochondria) and different biological membranes. There is optimal concentration of each trace element in a particular tissue. Its excess can be toxic and its insufficiency may lead to metabolic disorders. Zinc is widely distributed in all tissues. Nearly 99% of total body Zn is inside the cells, the remainder in plasma and extracellular fluids. Zn content of red cells is approximately ten times that of serum Zn. It's also involved in the synthesis and stabilization of proteins. Zn plays a clear role in the synthesis, storage and secretion of insulin as well as conformational integrity of insulin in the hexametric form. So decreased Zn concentration affects the ability of the islet cells to produce and secrete insulin ultimately complicating the problem in Type 2 diabetes. The Cu exists largely in the form of ceruloplasmin in plasma. The ceruloplasmin Cu constitutes 90-95% of serum Cu. Most of the remainder of the plasma Cu is albumin bound and 1-2% associated with amino acids. Cu is an integral part of numerous enzymes like amine oxidases, ferroxidase, cytochrome c oxidase, superoxide dismutase, dopamine hydroxylase-all are involved in metabolic processes. Therefore Copper deficiency leads to abnormal metabolic processes like glucose intolerance. Moreover Copper depletion experiments with men and women have revealed abnormalities of lipid metabolism besides impaired glucose metabolism. The aim of this study was to find out the association between fasting plasma insulin and micronutrients Cu and Zn in plasma, RBC among both the healthy control and newly diagnosed type 2 DM.

Statement of the Problem: Copper and Zinc are extremely important trace elements involved in a number of metabolic processes. Imbalance of trace elements may be the consequence of certain disorders (Khan 1994). Zn plays a major role in the synthesis, storage and secretion of insulin as well as conformational integrity of insulin in the hexameric form. The decreased Zn affects the ability of the islet cell to produce and secrete insulin thus compound the problem, particularly in Type 2 diabetes. Cu is an integral part of numerous enzymes like cytochrome c- oxidase, superoxide dismutase involved in metabolic processes.

Methodology & Theoretical Orientation: The aim of this study was to find out the association between fasting plasma insulin and plasma, Cu-RBC and Zn-RBC among both the control healthy, newly diagnosed type 2 DM. A case control study was carried out in the Department of Biochemistry jointly with the Department of Endocrine Medicine of Bangabandhu Sheikh Mujib Medical University. A total of 64 non-smokers, non-alcoholic, normotensive subjects free from renal and hepatic diseases were included in this study. Among them thirty three were newly diagnosed by type - 2 DM. Thirty one were age and sex matched healthy control.

Findings: Mean±SD of fasting insulin was 13.13±7.87 µU/mL and 16.53±13.78 µU/mL in healthy controls and newly diagnosed type 2 DM. The median value of RBC Zn of both groups was 6984.00 ppb (ranging 5693.50-7796.00 ppb) and 5155.50 ppb (ranging 2820- 6153 ppb) respectively (p< 0.0001, r = -0.7881) in newly diagnosed type 2 DM. All the median values of trace elements significantly differed between groups.

Conclusion & Significance: At the end of the study, we can conclude that alteration of trace element status is seen in the case of newly diagnosed type 2 diabetic patients in Bangladesh. May be their alteration is associated with the development of the disease and also with its complications. Moreover intracellular level offered more conclusive information than the plasma level. Micronutrients derangement could be related to type-2 diabetes mellitus development as well as its complications.