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Pattern of malondialdehyde, Copeptin and Osteopoietin Parameters in Patients with People Living with Diabetes.

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Abstract:

The purpose of the study was to assess the levels of osteopoietin, copeptin, and malondialdehyde in diabetics. A control group of 100 healthy people between the ages of 55 and 75 comprised the study's 100 diabetic patients. ELISA was used to test blood samples. The results showed that individuals with diabetes had considerably greater levels of osteopoietin, copeptin, and malondialdehyde than the control group ($p<0.05$). These results most likely show that among diabetics, osteopoietin, copeptin, and malondialdehyde are positively correlated.

Keywords: diabetes; osteopoietin; copeptin; and malondialdehyde

Introduction:

An excessively elevated blood glucose level is the cause of the condition diabetes. The body uses glucose as its main energy source.Although glucose can be produced by the body, it can also be obtained through diet [1].

The pancreas secretes the hormone insulin, which facilitates glucose uptake by cells for energy production. Diabetes is characterized by the body's inability to produce enough insulin or using it improperly. After then, glucose remains in the blood and does not enter the cells. Diabetes increases the risk of kidney, nerve, heart, and eye damage. There is a connection between diabetes and some cancers. Taking action to control or prevent diabetes may reduce the chance of acquiring health issues related to the disease [2].

Type 1 and type 2 diabetes are the most prevalent forms of the disease.Type 2 diabetes mellitus comprises of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin production, and excessive or incorrect glucagon secretion. Many macrovascular, neuropathy, and microvascular problems are linked to poorly managed type 2 diabetes [3].

Diabetic microvascular problems encompass retinal, renal, and perhaps neuropathic disorders. Macrovascular problems include coronary artery and peripheral vascular disease. Peripheral and autonomic nerves are affected by diabetic neuropathy [4].

Patients with type 2 diabetes are not completely dependent on insulin for the rest of their lives, in contrast to those with type 1 diabetes. The previous terminology for diabetes types 1 and 2, insulin-dependent and non-insulin-dependent, were derived from this differentiation [5].

But insulin is finally used to treat type 2 diabetes in a large number of people. They are regarded as requiring insulin but not dependent on it because they are still able to secrete some endogenous insulin. Nevertheless, the earlier labels have been dropped due to the possibility of misunderstanding resulting from classification based on therapy rather than cause. Adult-onset diabetes was an earlier term for type 2 diabetes mellitus. Currently, type 2 diabetes mellitus is developing in children at younger and younger ages due to the epidemic of childhood obesity and inactivity. Despite the fact that type 2 diabetes mellitus usually strikes people over 40, it has been identified in infants as young as 2 who have a family history of the disease. Children with newly diagnosed diabetes in many places now have a higher prevalence of type 2 diabetes than type 1 [6].

Diabetes mellitus is a chronic condition that needs to be managed for the duration of one's life in order to prevent catastrophic consequences from developing and to control those that do. The cost of this illness is disproportionately high. Medical expenses for patients with confirmed diabetes were 2.6 times more, on average, than those projected had they not had diabetes [7]

It seems that in diabetics, there is a connection between osteopoietin, copeptin, and malondialdehyde. Malondialdehyde (MDA) is a highly reactive molecule that is employed as a measure of lipid oxidative damage. It is produced when polyunsaturated fatty acids undergo lipid peroxidation. Malondialdehyde (MDA) is produced as a consequence of the synthesis of prostaglandins and thromboxanes as well as from the oxidation of lipids. It is present in the atherosclerotic plaque formations that are accelerated by diabetes and its plasma concentration rises in diabetes mellitus [8].

Osteopontin (OPN) is a pro-inflammatory cytokine that plays a role in mediating chronic inflammation and regulating immunological responses. OPN is a cytokine that promotes inflammation and works by modifying the response of immune cells. It sets off a number of long-term inflammatory illnesses and may be a major factor in the development of insulin resistance and adipose tissue inflammation. OPN is regarded as a model for the complex inflammatory mechanisms that underlie metabolic syndrome. Obesity's visceral adipose tissue has a considerable increase in OPN, and a deficiency in it guards against the onset of inflammation and insulin resistance. OPN expression in human macrophages is induced by various pro-inflammatory mediators, such as oxidized LDL, TNF-α, and IL-6, which are known to be elevated in obesity, cardiovascular disease, and type 2 diabetes. By promoting endothelial cell migration and the inflammatory processes linked to coronary artery disease, OPN raises the risk of atherosclerosis [10].

Copeptin is a highly stable 39 amino acid glycopeptide that is produced during the cleavage product of vasopressin synthesis and serves as a marker for vasopressin secretion. Measuring copeptin can help diagnose diabetes insipidus and other conditions where vasopressin secretion is disrupted [11]. Consequently, this investigation was done in an effort to shed light on the possible significance of copeptin, osteopoietin, and malondialdehyde parameters in patients with diabetes.

Materials and Methods:

Study Area:

The study was carried out in the Diabetic unit of Federal Teaching Hospital, Owerri. It is a tertiary health institution involved in providing medical care to individuals with diabetics and is located along Orlu road in Owerri Municipal, Imo state.

Owerri is the capital of Imo State in South Eastern Nigeria and the indigenous ethnic group is Igbo. Its geographical coordinates are 5.48° North latitude, 7.08° East longitude and 150 meters above sea level. Owerri is rich in Agricultural land and has quite a number of restaurants, fast food centres, hotels, schools, markets, churches and a few industries. Owerri has many professionals, artisans, skilled and unskilled man power and there are differences in their nutritional and social lifestyles.

Ethical approval:

The ethical approval of Federal Teaching Hospital Owerri was gotten and Informed consent was also obtained from prospective participants.

Subject Selection and Selection Criteria:

One hundred (100) subjects of both sexes between the ages of 55-75 years and who had blood sugar of 200mg/dl or above and who have been attending the diabetic clinic of Federal University Teaching Hospital, Owerri for not less than three months was recruited for the study. One hundred (100) subjects who were apparently healthy served as the control group.

MDA, the end product of lipid peroxidation was evaluated spectrophotometrically as thiobarbituric acid reactive substances (TBARS) . Osteopontin, and copeptin hormones were analyzed using an immunological technique called Enzyme-Linked Immunosorbent Assay (ELISA) with a BioTek ELx800 Reader

Statistical Analysis:

Data was analyzed using software statistical package for social sciences (SPSS) version 21, windows 9. Difference in mean values between two groups were assessed using student t-Test at P =0.05 (95% confidence interval). Tests with a probability value of P<0.05 were considered statistically significant. Values were expressed as mean ± standard deviation (mean ± S.D).

Results:

Parameters (Units)	diabetes (n=100)	Control (n=100)	P –value
MDA (nmol/mL)	6.89± 0.79*	2.11± 1.53	0.05
Copeptin (ng/ml)	268.11 ± 22.60*	46.69 ± 8.64	0.05
Osteopoietin (ng/ml)	9.03 ± 2.86*	5.99 ± 1.08	0.05

Table 1: The level of malondialdehyde, Copeptin and Osteopoietin Parameters in people living with diabetes.

*Significantly increased when compared to control at p<0.05

Discussion:

In the current investigation, we found that individuals with diabetes had higher MDA levels. Numerous writers proposed a correlation between MDA and diabetes. which resulted in a rise in oxidative stress [12]. According to earlier research, oxidative stress may be a major factor in the aetiology and development of diabetes, and there is a direct correlation between oxidative stress and the emergence of insulin resistance. Serum MDA levels were shown to be greater in malfunctioning cases in earlier research. One possible explanation for the rise in MDA levels is either an increased generation of reactive oxygen species or a deficiency in the antioxidant defense system [13].

Furthermore, a substantial rise in osteopontin was seen in diabetic patients compared to controls (p<0.06). Increased osteopontin levels could be a sign of diabetic vascular injury. Chronic elevations in osteopontin are clinically associated to a greater risk of severe diabetes, regardless of conventional risk factors [14]. Osteopontin expression levels are regularly raised in a wide range of chronic inflammatory diseases, including various malignancies, wound healing, and autoimmune disorders. Angiotensin II, low oxygen tension, oxidized oxygen species, and high glucose levels are some of the factors that increase the expression of osteopontin. All of these factors contribute to chronic vascular inflammation. In the event that this inflammation is not subsided, osteopontin expression becomes persistent and chronic. Osteopontin has attracted a lot of attention lately as a potential disease biomarker [15].

The study discovered a correlation between diabetes and high copeptin levels. is a 39-amino acid peptide that is formed from the copeptin, neurophysin II, and arginine vasopressin pre-pro-hormone C-terminus. The AVP gene encodes arginine vasopressin (AVP), also referred to as the antidiuretic hormone (ADH), which is involved in several renal and cardiovascular pathways and whose levels are abnormally linked to a number of illnesses. Vascular damage is connected to diabetes's elevated copeptin levels. [16]

Conclusion:

The study found that the amounts of osteopoietin, copeptin, and malondialdehyde were all noticeably higher in diabetics. These results imply that these biomarkers—copeptin and osteopontin, in particular—may be crucial markers of the severity and course of diabetes. Patients with diabetes may benefit from earlier diagnosis and better treatment outcomes if these physiological indicators are monitored.

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