REVIEW ARTICLE

Assessment of Serum Omentin-1, Adipsin and Resistin Levels in Beta Thalassemia Male Patients in Baghdad City of Iraq

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ABSTRACT

Adipocytokines has a significant impact on the development of many illnesses. (e.g. beta thalassemia), This research aims to determine the levels of Omentin-1, adipsin and resistin of (35) male patients their age (20–30) years that effected with Beta-Thalassemia city and (15) of healthy people as control group in Baghdad city by using enzyme linked immuonsorbant assay (ELISA). The findings of this research revealed a significant increase ($p \leq 0.01$) in levels omentin-1, which are (78.33 ± 6.14) pg/mL in patients group and (35.88 ± 5.8)) pg/mL in control group. The levels of adipsin show a significant increase ($p \leq 0.01$), which are (603.13 ± 11.46) ng/mL in patients group and (171.76 ± 17.45) ng/mL in patients group in control group, also a significant increase ($p \leq 0.01$) in the levels of resistin which are (2.1 ± 0.5) ng/mL and (0.35 ± 0.06) ng/mL in control group.

Keywords: Beta thalassemia, Adipocytokines, Omentin-1, Adipsin, Resistin

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INTRODUCTION

The autosomal recessive genetic condition thalassemia is brought on by a defect in the creation of a single or several globin chains. Hemoglobin (Hb)[1] production is altered by the impairment. Anemia caused by thalassemia can range in severity from moderate to life-threatening. People with ancestry from the Mediterranean, Middle East, Africa, and Southeast Asia are more likely to be thalassemia carriers.[2] These inherited anemias are brought on by mutations that reduce the production of Hb and red blood cell survival.

This balance is disturbed in thalassemias by the improper formation of the chain of globin. Any decrease in one of the globin chains' synthesis levels inside the growing red blood cell will lead to a buildup of the chain that is frequently formed. Thus, it cannot assemble into the typical hetero-tetramer with its heterologous partner. If globin chains are not removed, there will be an accumulation of them (beta-thalassemia). Similarly, if globin chains are created insufficiently. Developing techniques to extract and measure these globin chains allowed for these discoveries.[3,4]

These investigations made it possible to comprehend how these disorders' pathophysiology, which is caused by a chain imbalance.[5]

Red cell precursors in beta-thalassemia undergo apoptosis due to an overabundance of unpaired, insoluble globin chains, impairs erythropoiesis. Four tetramers (Hb Bart's) are formed by the additional non-globin chains in beta-thalassemia, after birth, four tetramers (HbH) and intrauterine life are established. They are both poor oxygen carriers, these two aberrant homotetramers (excessive affinities for oxygen). The extra chains have far more detrimental impacts on erythrocyte performance and oxygen delivery.[6,7]

The three main varieties of beta-thalassemia are: Major Thalassemia, often recognized as "Cooley's anemia" and "Mediterranean Anemia," is a blood disorder. Thalassemia mild and intermediate thalassemia is also known as "heterozygous beta-thalassemia," "beta-thalassemia trait," and "beta-thalassemia carriers." For the beta0 or beta + genes, those with thalassemia major are homozygotes or compound heterozygotes, those who have thalassemia minor are primarily heterozygotes, while those who have thalassemia intermedia are predominantly homozygotes or compound heterozygotes, except the uncommon dominant forms. Because thalassemias are hereditary diseases that can have serious consequences, neonatal maternity diagnosis and screening are crucial in treating patients. The clinical characteristics of thalassemia

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will be reviewed, emphasizing the lifestyle, iron overload, complications, treatment, genetic moderating factors, pathogenesis, and diagnosis of beta-thalassemia.[8,9]

Inflammation is recognized to play a big part in how -thalassemia problems develop, even though hereditary hemoglobinopathy is caused by faulty hemoglobin synthesis, resulting in massive quantities alpha-globin chains that prevent erythropoiesis and cause hemolysis. Patients with beta-thalassemia have elevated levels of inflammatory cytokines and a persistent inflammatory condition.[10]

Adipose tissue now known to operate as an important endocrine organ and usually generates multiple cytokines referred to as adipocytokines, such as tumor necrosis alpha, interleukin (IL-6), leptin, omentin,adipisn visfatin, and resistin. These cytokines have multiple biological functions and significantly contribute to regulating the body's homeostasis.[11,12] Leptin and adiponectin, two of these cytokines that have considerable influence on the inflammatory process, have received a lot of attention. Numerous metabolic, vascular, and inflammatory illnesses are thought to have key roles for adipocytokines in their etiopathogenesis.[13] Adiponectin has received a lot of attention among these cytokines since it greatly impacts the immune system.[14] A few examples The adipocytokines included in this group include adiponectin, resistin, visfatin, leptin, plasminogen activator inhibitor type 1 (PAI-1), tumor necrosis factor (TNF), IL-6, and IL-8.[15,16]

Omentin-1 is an adipokine that reduces inflammation is a biomarker that lowers chronic inflammation, potentially improving the sensitivity of insulin and the metabolism of glucose.[17] Omentin has no intrinsic insulin-like action since it has little impact on basal glucose transport while increasing insulin-mediated glucose transport.[18] Adiponectin, high-density lipoprotein cholesterol, and endothelial function are all positively linked with plasma omentin levels, while the body mass index (BMI), fat mass, and fasting plasma insulin are negatively correlated.[19,20]

Adipsin is a polypeptide that stimulates the complement alternative pathway and promotes triglycerides buildup in adipocytes. It is primarily produced by both adipocytes and the local macrophages, and It has been demonstrated to play a role in preserving pancreatic-cell function.[21]

The protein resistin, sometimes referred to as FIZZ3, is released by WAT and highly correlates with initiating inflammatory processes. In contrast to how white adipocytes predominantly make resistin in mice, macrophages and monocytes mostly create it in humans.[22] Resistin and adiponectin form circular homohexamers, giving them some structural similarities. Although the effects of resistin on humans are not fully understood, it is expected that resistin could support the development of insulin resistance.[23]

Our research aimed to examine at the serum levels of Omentin-1, adipsin, and resistin in beta-thalassemia patients to look for any potential relationships with disease severity or inflammatory indicators.

MATERIALS AND METHODS

Design of Study

This research includes Patients in this study were affected with beta thalassemia that Auditors of the Leukemia Center in Baghdad and the number of patients was 35, with 15 healthy persons serving as the control group, all participants their age (20-30) years old.

Samples Collection

In a macro centrifuge, a 5 mL blood sample was spun at 3000 rpm for 5–15 minutes after clotting for 20–30 minutes in a plane tube; the deep freezer (-20^{o}C) was then used to store fresh non-hemolysis serum. Hormonal tests were conducted on serum, which was divided into three tubes: one for each hormone.

Determination of Human serum Omentin-1, Adipsin and Resistin

Serum Omentin-1, adipsin and resistin have been determined by using kit assayed according to the manufactured procedure (SunLong Biotech Co.,LTD, China).and then test it by using ELISA.

Statistical Analysis

ANOVA, or one-way analysis of variance, has been used to contrast groups in the statistical analysis, and the Duncan multiple ranges test was employed to delineate significant differences, particularly across groups. The statistical analysis was carried out using the statistical software (SPSS) at the time when the statistical significance standard was created (p 0.01).

RESULTS AND DISCUSSION

Omentin-1

The findings revealed that mean ± S.D. of serum Omentin-1 concentrations in beta-thalassemia patient group were (78.33 ± 6.14) pg/mL and (35.88 ± 5.8) pg/mL in control group, as seen in Figure 1.

The current investigation found that serum levels of Omentin-1 significantly increased ($p \leq 0.01$) in the patients group contrasted with the control group.

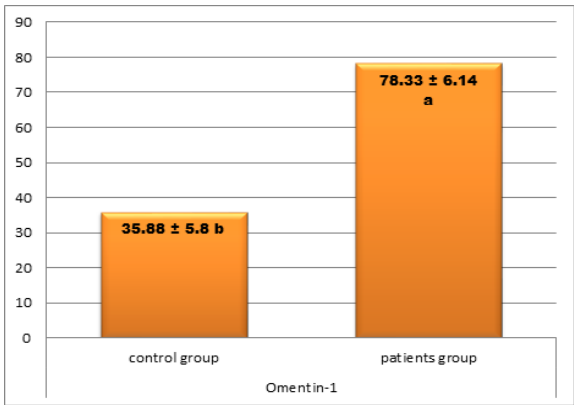

Figure 1: Levels of Omentin-1 in patients as compared with control group by (pg/mL).

***The Different Letter Means a Different Significant at (0.01)**

Omentin-1 levels in the blood are abnormal in a number of pathological conditions, including blood disorders, anemias, diabetes mellitus (DM), and obesity.[24] However, it's interesting to note that these conditions have also been linked to endothelial dysfunction, atherosclerosis.[25] This adipokine's anti-inflammatory function has also been theorized more recently concerning certain systemic illnesses.[26,27] It's interesting to note that there is mounting evidence that A crucial function is played by omentin-1 in the physiological control of iron. Omentin-1, sometimes referred to as intelectin-1 or the intestinal lactoferrin receptor, is found in high concentrations on the small intestine epithelium's brush boundary membrane and functions as a mediator for the uptake of lactoferrin that is bound to iron and its entry into the body after that by enterocytes through receptor-mediated endocytosis.[28]

Additionally, Omentin-1 has been researched as a potential biomarker and considers several pathological disorders, such as diabetes, hypertension, inflammation, and beta-thalassemia.[30-32] It's important to note that Omentin-1 has been shown to play a number of biological activities, including binding to using lactoferrin as a gut receptor and fostering intracellular iron-mediated processes, depending on its capability to affect on mobilization and uptake of iron.[28,29]

More in-depth research is eagerly anticipated to clarify the biological importance of determining which organ or system this protein Omentin-1 in HD patients' iron balance regulation executes its crucial regulatory duties. broader research are required to examine the therapeutic usefulness of Omentin-1 as a biomarker for distinguishing between an actual and a relative absence of iron, diagnosing aberrant iron states, and directing long-term iron replacement treatment.

Adipsin

The study showed that mean ± S.D. of serum adipsin concentrations in the beta-thalassemia patient group were (603.13 ± 11.46) and (171.76 ± 17.45) ng/mL in control group, as shown in Figure 2.

The current investigation found that serum levels of adipsin significantly increased ($p \leq 0.01$) in the patients group contrasted with the control group.

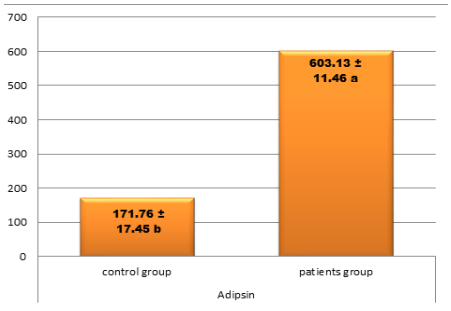

Figure 2: Levels of Adipsin in patients as compared with control group by (ng/mL).

Adipsin, one of the adipocytes, is also known as complement factor D and was the first one to be characterized and considered as a pro-inflammatory biomarker to induce a cascade of pathways in complement system.[32] Adipsin helps to maintain the homeostasis of adipose tissue and boosts insulin production in response to glucose. Additionally, by regulating the alternative complement pathway, it catalyzes the formation of C3a, an active form of component 3, C3, leading to an increase in pancreatic insulin secretion.[33,34]

***The Different Letter Means a Different Significance at (0.01)**

Complement 3a (C3a), anaphylatoxins, and C5a are examples of signaling molecules produced due to adipsin's role in creating the C5-C9 membrane assault complex.[34]

Adipsin initially cleaves complement factor B during the manufacture of these signaling molecules, which catalyzes the development of C3 convertase and the hydrolysis cascade that produces distinct complement fragments such C3a, C3b, C5a, and C5b. According to a paper, hereditary C3 insufficiency is linked to metabolic disorders, anemias (e.g. thalassemia) and obesity.[33,34]

Resistin

The study showed that mean ± S.D. of serum resistin concentrations in the beta-thalassemia patient group were (2.1 ± 0.5) ng/mL and (0.35 ± 0.06) ng/mL in control group, as shown in Figure 3.

In the present study, serum levels of resistin significantly increased ($p \leq 0.01$) in the patients group compared with the control group.

Resistin is regarded as a cytokine that promotes inflammation.[35] Resistin appears to have immune-modulatory capabilities, much like adiponectin. In murine and human macrophages, Human plasma resistin increases the generation of IL-6, IL-12, and TNF-alpha, which are pro-inflammatory cytokines.[36,37,44]

Additionally, recombinant human resistin[36] activates human endothelial cells, causing to produce more endothelin 1, numerous adhesion molecules, and chemokines. Resistin could participate and create of metabolic syndrome insulin resistance and obesity.[38-41] The amount of inflammatory mediators correlates with an elevation of plasma resistin concentrations, which predicts the severity of coronary atherosclerosis.[42] Silswal *et al.*[36] found that Those with severe thalassemia and those with intermediate thalassemia had greater resistin concentrations than the control group and patients with mild thalassemia). It agrees with Enli *et al*.,[43] who found that resistin concentrations were significantly higher in patients with thalassemia major than in controls in their study.

These findings suggest that comparable outcomes with resistin concentration vary in accordance with the severity of the disease.

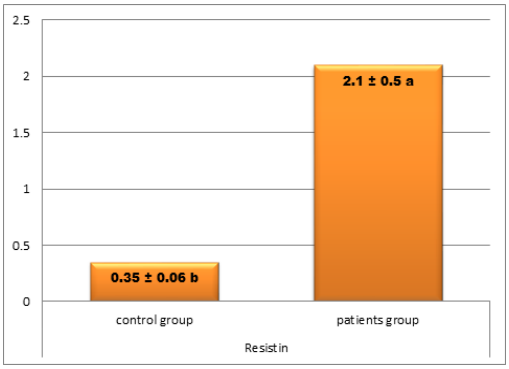

Figure 3: Levels of Resistin in patients as compared with control group by (ng/mL).

CONCLUSIONS

The results show that adipocytokines (Omentin-1, Adipsin and Resistin) have the main role in the development of Beta-thalassemia and also have pro-inflammatory roles in inducing the immune system to release many cytokines as part of the immune response towards the progressive of disease and could these cytokines consider as a novel biomarker to detect the severity of the disease.

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