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Original Article

Evaluating the level of IFN Gamma in diabetic patients

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ABSTRACT

Introduction: Diabetes is one of the most common diseases in the world. Its prevalence is estimated to be 5% in Iran and it is increasing by rate of 1% per year. It is diagnosable by FBS and HbA1C tests. Objective: The objective of this study was to evaluate the relationship between HbA1C fluctuations and level of interferon gamma and Hs CRP in diabetic patients. Methodology: the research was conducted in the form of case and control, in which case group included 45 diabetic patients whose HbA1C levels were more than 6 AU / ML and 45 healthy subjects were selected as control group. Blood samples were taken from all subjects and HbA1C and interferon-gamma tests were performed using the ELISA method according to the kit's guidelines. Results: Mean HbA1C was 8.8 AU/ML and 5.5 AU/ML in case group and control group, respectively. IFN Gamma level in subjects of case group was about 84.7% more than normal level. Conclusion: According to the obtained data, the mean serum level of IFN-γ was more in diabetic patients with HbA1C than that in the normal people, and this difference was statistically significant.

Keywords: FBS, HbA1C, Interferon gamma

Introduction

Diabetes is one of the most common non-communicable diseases, associated with multiple complications. In addition, as it is non-symptomatic in the early stages, half the diabetics are not aware of their disease. Therefore, a set of factors is considered as a risk factor in this disease, and it is recommended that people with these risk factors to be screened. Diabetes is a multi-factorial disease, and it seems that genetic, environmental and immunological factors to be involved in development of the disease [1]. Nowadays, due to the immunological role of acute phase of proteins and cytokines, their relationship with various diseases is examined. Studies conducted to predict the diabetes have shown that long-term low inflammation in the body may ultimately lead to clinical expression of type 2 diabetes. Moreover, various mechanisms show that cytokines can be involved in development of diabetes. By increasing the levels of acute phase proteins, more inflammatory cells bind to the fat tissue and pancreas beta. They affect only beta pancreatic cells and contribute to apoptosis and breakdown of beta cells, so they ultimately lead to Type 2 diabetes [2]. It should be noted that both obesity and Type 2 diabetes are associated with chronic inflammation. It is also associated with increasing levels of protein in acute blood circulation response and cytokines in diabetic patients [3]. Normal methods for diagnosis of diabetes are biochemical tests of blood sugar and urine tests. Physicians prescribe usually two types of tests to diagnose hidden diabetes: a fasting blood glucose test (FBS) and Hb A1C [3] test (blood glucose level in last 3 months) [4]. A group of proteins secreted from various cells of the body, including defense system cells in response to stimulation and affects immune function is called cytokines. Cytokines are a group of proteins playing a major role in inflammatory responses to pathologic stimuli such as inflammation and tissue damage. Cytokine production is regulated by a range of physiological stimulants such as exercise.

The cytokines produced, expressed and released from muscle fibers are called myokines, endocrine, and autocrine, which cytokines are responsible for transmitting messages among the cells. The outcome of the presence of cytokines is to change the behavior of cells, which have a secreted cytokine receptor, including growth, alteration, or death of cell. The effect of cytokine produced by a single cell is more on cells around the same cell, but it can have effect on whole organism [5]. Inflammation occurs when the immune cells of the body secrete hormones called cytokines, which is a normal reaction to the disease. However, when the cytokine hormones are secreted excessively, the inflammation becomes uncontrollable and causes harm to the body, and these are signs of interferon gamma [6]. The objective of this study was to evaluate the

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relationship between blood glucose level and interferon-gamma level in type 2 diabetic patients, admitted to Ibn Sina laboratory in Ilam province in 2015. Its results can be used in health plans of the country.

Methodology

To determine the sample size, the Cochran formula of

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left(\frac{z^2 pq}{d^2} - 1\right)}$$

was used and the subjects were selected randomly from different age groups (older than 15 years subjects) of patients, admitted to Ibn Sina medical diagnostic laboratory in Ilam. This is an analytical case-control study, in which subjects with fasting blood glucose higher than 125 mg / dl (n=450 were selected as case group and subjects with fasting blood glucose lower than 125 mg / dl (n=45) were considered control group. The research population included Ilam city. The inclusion criterion of study included having age above15 years and the exclusion criteria of study included pregnancy and having cardiovascular diseases, asthma and allergies. The level of fasting blood glucose and the level of interferon gamma were measured in the serum of both groups according to the kit's manufacturer company's guidelines. Data were analyzed based low or high fasting blood glucose and measurement of the last three months of glucose and the levels of inflammatory cytokines in each group using t-test and comparisons of variables in different groups by using ANOVA test. The correlation between quantitative variables was measured using Correlation Pearson method and the final report suggests association between host factors (FBS, HbA1C) and severity of cytokine secretion.

Results

The present study was conducted to evaluate the relationship between FBS, HbA1C and interferon gamma in diabetic and healthy subjects. Evaluation and diagnosis of the disease were performed based on fasting blood glucose test and complementary tests. The objective of this study was to evaluate the relationship between blood glucose fluctuations and IFN-γ level using diagnostic and severity of the disease methods. Forty and five diabetic patients were included in the study, which 58.7% of them were female and the rest were male. The mean age of the patients was 54.2 years. In general, the mean FBS in the case group was 175 mg / dl and the mean HbA1C was 8.8 AU / ML in that group and the mean IFN-γ level was 38.9 AU/ML in this group, which was about 84% of subjects in the case group had an IFN-γ level higher than normal level, and this difference was statistically significant (P≤0.03363) in addition, 97.8% of subjects had HbA1C levels higher than normal, which was statistically significant (P≤0.001).

Table 1: correlation between age and HbA1C and IFN –γ and FBS test

Control group	Case group	FBS
0/183	0/186	age
0/380	0/001	HbA1C
0/469	0/036	IFN- γ

Discussion

HbA1C shows the last three-month glucose test in people. Therefore, in diabetic people, this level of this factor is higher than that in non-diabetic subjects due to high blood glucose levels [4]. Investigations suggest that the mean HbA1C level in the case group was 8.8 and it is 5.3 in the control group. The mean difference was 1.6, which HbA1C in diabetic patients, having higher FBS than normal level, is higher than that in non-diabetic people. In the studies conducted by Ikla et al., the mean difference of HbA1C in the two groups was 3.5 and HbA1C level was higher in diabetic patients than that in the control group [7]. In the studies conducted by Nayal et al., the mean difference of FBS in the case and control groups was 80 and the mean difference in HbA1C level in the case and control group was 3.5. They concluded that there was a significant relationship between FBS and HbA1C and diabetic people have higher HbA1c than non-diabetic patients [8]. Dr. Sota et al examined the association between fasting blood glucose and HbA1c and concluded that there is a significant relationship between FBS level and HbA1C and PPBS levels, and HbA1C is a golden standard in assessing blood glucose control and observing diet and the development of this disease in the past few months [9]. IFN-γ is an inflammatory cytokine, involved in the development of fibrosis in inflamed tissues, and studies have shown that interferon gamma is very important for host defense against many infections. The present study showed that the difference mean of IFN-γ in case group and control was equal to 15.5 and IFN-γ level was higher in diabetic subjects than that in healthy subjects. The expression of cytokines depends on several factors, including infection, inflammation, hormone conditions, and cytokine gene polymorphism [10].

Zone and Lili et al conducted studies on the level of IFN-γ in diabetic patients and concluded that IFN-γ was higher in diabetic subjects than that in healthy subjects and argues that IFN-γ destructed beta cells of islets of Langerhans leading to insulin resistance, which contributes to the development of diabetes [11]. Line et al conducted study on IFN-γ in diabetic mice and the results showed that IFN-γ in the diabetic group is higher than that in non-diabetic mice, and this cytokine was involved in development of diabetes [12]. In a research conducted by Rafee Nejad et al in 2014 on IFN-γ polymorphisms in type 1 diabetes, they concluded that type 1 diabetes is a chronic and

progressive autoimmune disease, and significant correlation was found between IFN-γ polymorphism and diabetic and healthy subjects [13]. In a research carried out by Mohammad Kazemi et al on the correlation between type IL-4 and IFN-γ polymorphisms in Type 2 diabetes, they concluded that IFN-γ polymorphism is associated with diabetes, but a significant relationship was not found between IL-4 polymorphism and diabetes [14]. In the studies conducted by Tisavo et al on the relationship between IFN-γ and the cells produced from it and diabetes, results showed that IFN-γ plays an important role in the development and progression of diabetes, since it destructs beta cells of the islets of Langerhans and causes insulin resistance, leading to diabetes development [15].

Conclusion: The present study was conducted to evaluate the relationship between HbA1C and FBS fluctuations and IFN-γ level. Results of this study showed a direct correlation between HbA1C and IFN-γ levels and an increase in FBS in subjects. When fluctuations of blood glucose are higher, the immune responses would be toward increasing level of IFN-γ, which is considered as one of the prognostic factors in the disease.

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