COMPARISON OF HOMA-IR VALUES IN COVID-19 NEGATIVE AND POSITIVE PATIENTS

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ABSTRACT

Objective

This study compared the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) values of COVID-19 patients with COVID-19 negative (-) patients.

Method

A total of 2116 COVID-19 + patients, 1186 men and 850 women, and 1127 COVID-19 - patients, 313 men and 814 women, were included in the study. The study was conducted on patients with definite COVID-19 + and - between June 1, 2020 and July 31, 2020. The patients' data were obtained retrospectively from the hospital information management system (HIMS). The diagnosis of COVID-19 in the included patients was made by a real-time polymerase chain reaction and computed tomography lung scanning. The relationship between the HOMA IR values of COVID-19 + and - patients was compared.

Results

The HOMA IR value of patients who were positive without gender discrimination was found to be significantly higher in patients with COVİD-19 + patients. No significant gender differences were detected in HOMA IR values in COVİD-19 + patients. The HOMA IR values of men were found to be significantly higher in patients with COVID-19 – patients in differences according to gender. A positive correlation was found between age and HOMA IR in COVID-19 patients.

Conclusion

While it was determined that the HOMA-IR values of COVID-19+ patients were significantly higher without gender discrimination, there was no significant difference in HOMA-IR values in COVID-19+ patients according to gender.

KEYWORDS

COVID-19, HOMA IR , Insuline,Gender

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INTRODUCTION

Severe acute respiratory syndrome (SARS) disease was first seen in China. It emerged at the end of February 2003 and was detected during an epidemic that spread to 4 countries. SARS, the first of the coronavirus epidemics, is a severe acute respiratory syndrome disease that affects the respiratory system (Beşirbellioğlu, 2007). It first started in China in 2003, and approximately 8096 cases were seen, resulting in 744 deaths and affecting 129 countries (Cascella et al., 2023). Coronavirus disease 2019 (COVID-19) is a highly contagious infection caused by coronavirus 2 (SARS-CoV-2), which was first seen in Wuhan, China and causes severe acute respiratory syndrome (Çelik et al., 2020). The first clinical signs of the disease in COVID-19 patients are symptomatic. Although findings similar to other viral infections are observed, it is not possible to distinguish it from other viral infections. Fever and cough are the most common symptoms seen in COVID-19 infections. In addition, COVID-19 can cause inflammation of the respiratory tract, as well as death and visceral failure. While fever is seen in more than 80% of patients, cough is seen in more than 60%. Complaints such as fatigue, myalgia and shortness of breath are also common in COVID-19 patients. Complaints of a headache and sore throat, anorexia, hemoptysis, nausea, diarrhoea, and impaired sense of smell and taste are also observed lowly (Fu et al., 2021, Yazar et al., 2021).

Insulin is an important hormone secreted by the pancreas that allows glucose in the blood to be taken into the cell and used. Insulin resistance is seen in fat, muscle and liver cells. Appear to be resistant to its effects. Insulin resistance affects multiple organ systems in the body and can be seen in both sexes at any age. The most critical factors causing insulin resistance are; genetic structure, unhealthy diet and inactivity (Sheu et al., 2000, Despres et al., 1996).

This article, it was aimed to investigate the effect of COVID-19 infection on Homeostatic Model Assessment for Insulin Resistance (HOMA IR) levels by comparing the HOMA IR values of COVID-19 + patients and COVID-19 - patients admitted to the hospital.

MATERIAL AND METHOD

Ethical approval of the study was given by the Medical School Ethics Committee (Ethical Number: E-71522473-050.01.04-241721-168). A total of 2116 COVID-19 + patients, 1186 men and 850 women, and 1127 COVID-19 - patients, 313 men and 814 women, were included in the study. The study was conducted on patients with definite COVID-19 + and - between June 1, 2020 and July 31, 2020. The data of the patients were obtained retrospectively from the hospital information management system. The diagnosis of COVID-19 in the included patients was made by a real-time polymerase chain reaction and computed tomography lung scanning. The relationship between the HOMA IR values of COVID-19 + and - patients was compared. In the calculation of insulin resistance, it is calculated by considering fasting insulin values and glucose values. The HOMA-IR method is commonly used in these calculations (Bakris, 1995, Reaven, 1998).

Statistical analysis

An Independent T-test was used to compare the groups. Data that had a normal distribution were presented as mean ± SEM. Pearson determined correlations between age and HOMA IR in all participants. The significance level was set at $P < 0.05$.

RESULTS

The HOMA IR value of patients who were positive without gender discrimination was found to be significantly higher in patients with COVİD-19 + patients (Graphic 1). No significant gender differences were detected in HOMA IR values in COVİD-19 + patients (Table 1). The HOMA IR values of men were found to be significantly higher in patients with COVID-19 – patients in differences according to gender (Table 2). A positive correlation was found between age and HOMA IR in

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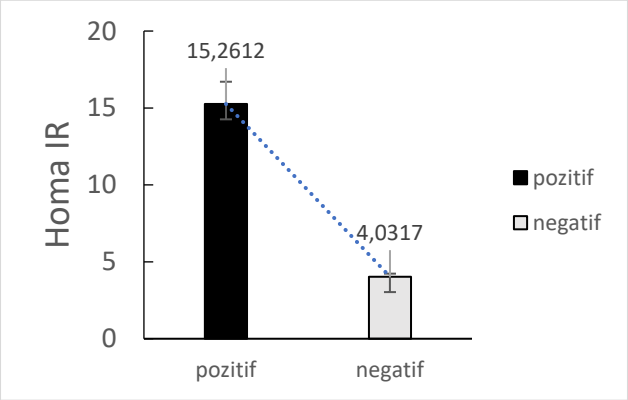
patients with COVID-19 – patients (Table 3). No significant relationship was found between age and HOMA IR in COVİD-19 + patients (Table 4).

Fig 1. HOMA IR values of patients according to COVID-19 (+) or (-) status



The HOMA IR value of patients who were positive without gender discrimination was found to be significantly higher in patients with COVID-19 +.

Table 1. Differences by gender in COVID-19 (+) patients

Gender		N	Mean	SD	SEM	p
HOMA IR	Male	1166	15,43	81,963	2,4	0.8
	Female	850	15,02	27,722	0,95	

No significant gender differences were detected in HOMA IR values in COVID-19 + patients.

Table 2. Differences by gender in patients with COVID-19

Group Statistics						
Gender		N	Mean	SD	SEM	p
HOMA IR	Male	313	5,26	8,612	0,486	0,001
	Female	814	3,55	5,752	0,201	

The HOMA IR values of men were found to be significantly higher in patients with COVID-19 - in terms of gender differences.

Table 3. Relationship between age and HOMA IR in patients with COVID-19 (-)

Correlations			
		Age	HOMA IR
Age	Pearson Correlation	1	,062*
	Sig. (2-tailed)		,036
	N	1132	1127
HOMA IR	Pearson Correlation	,062*	1
	Sig. (2-tailed)	,036	
	N	1127	1127
***. Correlation is significant at the 0.05 level (2-tailed).**			

A positive correlation was found between age and HOMA IR in patients with COVID-19 -.

Table 4. Relationship between age and HOMA IR in patients with COVID-19 (+)

Correlations			
		Age	HOMA IR
Age	Pearson Correlation	1	,013
	Sig. (2-tailed)		,555
	N	2017	2016
HOMA IR	Pearson Correlation	,013	1
	Sig. (2-tailed)	,555	
	N	2016	2016

No significant association was found between age and HOMA IR in COVID-19 + patients.

DISCUSSION

Insulin, secreted from the pancreas in response to an increase in blood glucose, inhibits gluconeogenesis and glycogenolysis in the liver and, as a result, inhibits hepatic glucose production. Insulin ensures that blood glucose is transported to peripheral tissues, especially muscle and adipose tissue, and enables glucose to be oxidized in order

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to store glucose in the form of glycogen or to produce energy. As a result of the decrease or loss of the effect of insulin to send glucose into the cell, insulin resistance occurs. When insulin resistance develops, the increased glucose in the blood stimulates the insulin secretion mechanism. Stimulation and release of insulin cause hyperglycemia and hyperinsulinemia. This is the most important picture of insulin resistance. Resistance to the effects of insulin in the liver, muscle and adipose tissue occurs. As a result of this resistance, liver-derived glucose production increases. There is a decrease in glucose uptake by insulin into muscle and adipose tissue (Scott et al,, 2005). Hyperinsulinemia due to the development of insulin resistance is one of the main factors of various diseases such as DM and hypertension. Hyperinsulinemia also acts on the retention of sodium from the renal tubules in the kidney leads to hypertension (De Fronzo et al. 1976). The aim of this study is to reveal the effects of COVID-19 disease on HOMA IR by comparing the HOMA-IR levels of COVID-19 + patients with COVID-19 - patients.

It is known that coronaviruses are involved in the pathogenesis of type 1 diabetes and the occurrence of respiratory tract infections. For this reason, it is predicted that there may be an increase in the frequency of type 1 diabetes due to COVID-19 disease in the future (Soliman et al., 2020). In patients with diabetes, there is an increase in the level of ACE2 receptors in the cell membrane, which facilitates the entry of the virus into the cells. In addition, increased glycosylation of this receptor with hyperglycemia further increases viral entry (Brufsky, 2020). Cytokine storm is seen in conditions such as hypertension, ischemic heart diseases, obesity, high inflammation and diabetes accompanying COVID-19 disease. Each of these comorbidities causes high mortality in these patients with cytokine storm (Kutlutürk, 2020). In the study of COVID-19 patients in China, the most important of the significant comorbidities associated with mortality cases were; hypertension, diabetes mellitus, heart disease, and cerebral infarction, and their prevalences respectively (53.8%), (42.3%), (19.2%) and (15.4%). Mortality was found to be 50% higher in diabetic patients than in nondiabetic patients (Gupta et al., 2020). In a study of 24 patients with COVID-19 infection, SARS-CoV-2 pneumonia patients with diabetes had a severe clinical picture in terms of organ damage, inflammatory factors, or hypercoagulability compared to patients without diabetes, with or without other comorbidities, and the prognosis for these patients was determined. Found to make it worse (Guo et al., 2020). In a retrospective study from Hubei, China, to determine the best glycemic targets for diabetic patients infected with SARS-CoV-2, it was determined that it is important to keep target glucose levels below 180 mg/dl. It has been observed that it reduces mortality when kept below this value. It has also been reported to result in less ARDS, acute heart and kidney injury, septic shock, and disseminated intravascular coagulation (DIC) (Zhu et al., 2020). The coexistence of diabetes and COVID-19 infection has shown that they are at high risk for medical complications. This indicates that the approach to diabetic patients is more prominent in diagnosis, treatment and follow-up for COVID-19 (Hill et al., 2020).

Many studies of HOMA IR have been conducted in non-COVID-19 patient groups. This study is the only study on HOMA IR in COVID-19 patients. This study shows that HOMA IR values, and insulin resistance, increase in COVID-19 patients and the rise is higher than in COVID-19-negative patients. This may indicate that COVID-19 infection is one of the factors that plays a role in the development of diabetes and negatively affects the prognosis of the disease.

CONCLUSION

While it was determined that the HOMA-IR values of COVID-19+ patients were significantly higher without gender discrimination, there was no significant difference in HOMA-IR values in COVID-19+ patients according to gender.

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