DOI: https://doi.org/10.53350/pjmhs2115103257

ORIGINAL ARTICLE

Examınatıon of The Relatıonshıp of Blood Parameters ın Overweıght Female and Male Indıvıduals

İBRAHİM KUBİLAY TÜRKAY[1]
[1]*Suleyman Demirel University, Faculty of Sport Science, Isparta/ Turkey.*
Correspondence to: Ibrahim Kubilay Turkey, Email: ibrahimturkay@sdu.edu.tr

ABSTRACT

Aim: This research was carried out to determine how the blood values of overweight female and male individuals are related to overweight.

Method: Overweight and obese 51 women and 76 men with a body mass index of 25% and above participated in the study. Body Mass Index is used to determine whether individuals are overweight. Individuals participated in the research with blood tests taken from an official health institution. “Volunteer Consent Form ”were obtained from individuals before participating in the research. SPSS package program was used for the research analysis. “Pearson Correlation” was used as the analysis. P <0.05 and P<0,01 were taken as the value.

Results: As a result of the research, it has been determined that there are positive and negative significant relationships between the blood parameters of overweight and obese male and female individuals, depending on overweight.

Conclusion: As a result, according to the research data, it has been determined that the body blood parameters of obese men and women negatively affect each other in a way that threatens health, depending on obesity. In order to prevent these risks to health, it is inevitable for individuals to apply a balanced diet together with regular exercise.

Keywords: Blood parameter, Overweight, Obesity, Male, Female, Relationship

INTRODUCTİON

Bmi (Body Mass Index): Overweight and obesity is one of the main reasons that trigger these ailments. In determining overweight, BMI is a criterion that is easily calculated (weight [kg] / height2 [m]) and accepted as a good indicator of subcutaneous and total body fat in clinical evaluation.(24) According to the World Health Organization (WHO, 2000) classification of Body Mass Index is as follows:

Weak: 0-18.49 (%)
Standard: 18,5-24.49 (%)
Overweight: 25-29.99 (%)
Obese: 30-39.99 (%)
Morbid Obese (fatal): 40 and above (%)

Obesity is a serious public health problem in Turkey as it is all over the world. In the Turkish Diabetes, Hypertension, Obesity and Endocrinological Diseases Prevalence Study-I (TURDEP) conducted in Turkey, the prevalence of central obesity was found to be 49% in women and 17% in men. In the TURDEP-II study conducted 12 years after this study, the rate of central obesity increased to 64% in women and 35% in men. It has been shown that the risk of death increases in adults with a BMI higher than 30 kg/m2. Excessive weight gain is associated with increased cardiovascular risk and hypertension.(1,4, 15)

Glucose Starvation: Glucose starvation is the rate of sugar detected in the blood after at least 8 hours of fasting. The determined rate is used in the diagnosis of diabetes. In people, the blood sugar value during the day is at its lowest level before the meal. In non-diabetic patients, glucose starvation before meals is usually between 70-80 mg/dl. Glucose starvation is the level of sugar in the blood measured after a certain fasting. It is normal for a glucose starvation level to be less than 100 mg/dL (5.6 mmol/L). A glucose starvation level is considered to be 100 to 125 mg/dL (5.6 to 6.9 mmol/L). If it's 126 mg/dL (7 mmol/L) or higher on two separate tests, you have diabetes.(12, 16, 21, 22)

Cholesterol: Cholesterol is a type of lipid, or fat, with a waxy structure found in the blood of people and produced naturally by all cells, especially in the liver. Cholesterol is a waxy substance found in the blood. In order for the human body to form healthy cells, it needs a certain amount of cholesterol to be used in the formation of cell membranes as well as some hormones and vitamin D. If the blood cholesterol level is below 200 mg/dl over the age of 20, it is considered ideal, between 200-239 mg/dl and above 240 mg/dl as high. If the blood LDL-cholesterol level is below 130 mg/dl, it is considered as high in the desired range between 130-159 mg/dl.(2, 3, 5, 6, 11)

Triglycerid: Triglycerides are chemical compounds digested by the body to provide energy for metabolism. Triglycerides are the most common fats in the body. It is the main ingredient of vegetable oils and animal fats.

Normal – Less than 150 mg per deciliter (mg/dL) or less than 1.7 millimoles per liter (mmol/L)

Borderline high – 150 to 199 mg/dL (1.8 to 2.2 mmol/L)

High – 200 to 499 mg/dL (2.3 to 5.6 mmol)

Very high – 500 mg/dL or higher (5.7 mmol/L or higher)

For an accurate triglyceride measurement, you must fast for 9-12 hours before blood is drawn.(12, 13, 14, 15)

Vitamin B12: It is a water-soluble vitamin found in foods of animal origin known as cobalamin. It is absorbed from the digestive tract with the help of intrinsic factor secreted from the cells in the stomach. B12, which passes into the blood circulation with absorption, contributes to the normal functions of the division process by passing to the cells.

In the normal human body, the liver tries to prevent the formation of deficiency by storing high amounts of vitamin B12. However, this store is only sufficient for a

limited time when vitamin B12 cannot be adequately absorbed or there is a deficiency in its intake with food.

In vitamin B12 deficiency;

- Pale or yellow skin appearance
- Fatigue and weakness
- Significant pins and needles and tingling sensations, especially in the extremities
- Wound and crack formation around the mouth
- Shortness of breath and dizziness
- Problems with vision functions
- Mood changes

The blood level considered normal for vitamin B12 is expressed as over 300 pg/ml. If this parameter is detected between 200-300 pg/ml, a borderline vitamin B12 deficiency can be mentioned in the person. If the test results below 200, this is defined as B12 deficiency.[23]

Wbc (White Blood Cell): WBC (white blood cell) is a value examined in complete blood count assays. The white blood cell value should be between 4,000-10,000 in adult humans. If the white blood cell count is lower than this value range, it is called leukopenia and indicates some diseases.[21]

Rbc (**Red Blood Cells):** 60% of blood is blood plasma. blood plasma; It is a white yellow colored liquid consisting of protein types, salts and vitamins. The remaining 40% of the blood is composed of blood cells. blood cells; erythrocytes (red blood cells or red blood cells), white blood cells (white blood cells, leukocytes), platelets, namely platelets. Blood cells are found in different environments in the blood, and the most abundant cells in the blood are erythrocytes, or RBC. While they constitute about 99% of all blood cells, leukocytes and platelets hold about 1% of them under their dominance.[2, 3, 5, 6,12, 14]

Insulin: Insulin resistance, also known as metabolic syndrome, is a condition in which cells in the human body's muscles, fat, and liver do not respond properly to insulin and therefore cannot use blood glucose for energy. The pancreas constantly produces more insulin to compensate for the increased glucose levels in the blood and to break the resistance built up in the cells. This causes blood sugar levels to rise over time. Insulin resistance syndrome, which appears to affect one in three people on average, can lead to medical problems such as obesity, high blood pressure, high cholesterol and type 2 diabetes.[10, 17, 18, 19, 20, 22, 23]

Hgb (**Hemoglobin):** Hemoglobin is an iron-rich protein produced in the bone marrow and stored in red blood cells. The oxygen in the air entering the lungs is carried to the tissues in the body by adhering to the hemoglobin in the blood.[8, 9]

The carbon dioxide formed in the tissues adheres to the hemoglobin, which releases oxygen, reaches the lungs and is removed from the body from there. A vital cycle that takes place in the body takes place with the logistic support of the hemoglobin protein.

Each hemoglobin protein can carry 4 oxygen molecules throughout the body with red blood cells. Hemoglobin protein ensures that red blood cells take the shape of a disc, move more easily in the body and are protected.

Since the parameter that reveals the amount of iron in the body is hemoglobin, it is the first parameter to be checked in anemia or iron deficiency problems. Anemia is the first problem that comes to mind when the hemoglobin level is lower than normal.[8, 14, 16]

If you have complaints such as extreme weakness, dizziness, shortness of breath, heart rhythm disorder, your hemoglobin level may be low. If your HGB level is above normal, it may be due to blood disorders, smoking and diarrhea.[8]

Since changes in the HGB level give very important signals in terms of general health status, it is one of the first parameters to be looked at in the diagnosis of many diseases today. Since sharp decreases in HGB value will limit the body's oxygen carrying capacity, the HGB parameter should be carefully examined before and after surgical operations. Decisions about whether the patient will need blood can be made by looking at this parameter.

Hemoglobin (HGB) Reference Range

The ideal range of hemoglobin in a healthy body varies according to age, gender, genetic structure, hormonal status and body structure. For this reason, the normal range values specified in the blood count may not reflect the truth for everyone. At this point, the opinion of the physician will be effective. The HBG value is measured in grams per deciliter (g/dL).

Hemoglobin reference ranges shaped by age and gender:

For newborn: 13.5 – 24 g/dL
For babies aged 0-3: 11 – 13 g/dL
For children aged 3-11: 12 – 14 g/dL
For adult men: 13.5 – 17.5 g/dL
For adult women: 12.5 – 15.5 g/dL

If hemoglobin values are found below these reference ranges, it can be interpreted as anemia, in other words anemia. The cause of anemia is determined and treatment is followed accordingly. If the hemoglobin values are found above these reference ranges, it qualifies that there is excess blood production in the body, and as a result of the evaluation of some additional indicators, the presence of some hematological diseases can be mentioned.[8,13,)]

MATERİAL AND METHOD

Overweight and obese 51 women (age mean= 28,2 ± 11,2) and 76 men (age mean= 27,3 ± 11,2) with a body mass index of 25% and above 30% participated in the study. Body Mass Index is used to determine whether individuals are overweight. Individuals participated in the research with blood tests taken from an official health institution. “Volunteer Consent Form ”were obtained from individuals before participating in the research. SPSS package program was used for the research analysis. “Pearson Correlation” was used as the analysis. P <0.05 and P<0,01 were taken as the value.

RESULTS

Table 1: Average Values of Overweight and Obese Male Individuals

Kilo	76	93,4487	16,33441
Bmi	76	30,0324	4,37053
Glucose starvation	76	99,5737	17,23205
Cholesterol	76	204,9171	53,11815
Trigliserid	76	192,3367	117,46325
VitaminB12	76	258,8829	99,99697
WBC	76	7,8708	1,86926
RBC	76	5,4922	,44783
HGB	76	15,7724	1,23774
Insulin	76	5,8828	2,94476

According to Table 1; the mean weight of overweight and obese male individuals was 93,4kg; BMI averages 30%; Glucose Starvation averages 99,5; Cholesterol averages 204,9; Triglyceride averages were 192,3; Vitamin B12 averages were 258,8; WBC averages of 7,8; RBC means 5,4; It is seen that the mean of HGB is 15,7 and the mean of Insulin is 5,8.

Table 2: Relationship Values of Overweight Male Individuals

			1	2	3	4	5	6	7	8	9	10
1	Kilo	Pearson Correlation	1									
		Sig. (2-tailed)										
2	Bmi	Pearson Correlation	,874**	1								
		Sig. (2-tailed)	,000									
3	Glucose Starvation	Pearson Correlation	,185	,277*	1							
		Sig. (2-tailed)	,109	,016								
4	Cholesterol	Pearson Correlation	-,001	,026	,195	1						
		Sig. (2-tailed)	,993	,823	,091							
5	Trigliserid	Pearson Correlation	,020	,066	,045	,643**	1					
		Sig. (2-tailed)	,864	,570	,697	,000						
6	VitaminB12	Pearson Correlation	-,081	-,087	-,126	,078	-,080	1				
		Sig. (2-tailed)	,487	,455	,278	,503	,490					
7	WBC	Pearson Correlation	,116	,177	,243*	,027	,037	-,216	1			
		Sig. (2-tailed)	,318	,126	,034	,820	,753	,061				
8	RBC	Pearson Correlation	,078	,081	-,020	-,040	,042	,038	,075	1		
		Sig. (2-tailed)	,505	,485	,866	,731	,721	,748	,518			
9	HGB	Pearson Correlation	,156	,167	,002	,068	,024	,184	,239*	,440**	1	
		Sig. (2-tailed)	,178	,149	,986	,561	,835	,112	,037	,000		
10	Insulin	Pearson Correlation	,185	,263*	,440**	,302**	,485**	-,292*	,213	,150	,080	1
		Sig. (2-tailed)	,109	,022	,000	,008	,000	,011	,064	,197	,490	

** p<0.01 *p< 0.05

According to Table 2; There is a significant positive correlation between the weight values of male individuals and Bmi values (r=,874 p<0.01); A positive significant relationship between Bmi values and Glucose Starvation values (r=.277 p<0.05) and between Bmi and Insulin values (r=.263 p<0.05); There was a significant positive correlation between Glucose Starvation values and WBC (r=.243 r=.874 p<0.05) and again between Glucose Starvation and Insulin values (r=.440 p<0.01), Cholestrol and Triglyceride values (r =,643 p<0.01) and a positive significant relationship between Cholestrol and Insulin values (r=.302 p<0.01), a positive correlation between Triglyceride and Insulin values (r=.485 p<0.01) There is a significant relationship between Vitamin B12 and Insulin values (r=,-292 p<0.05), a positive relationship between WBC and HGB values (r=.239 p<0.05). and there is a significant positive correlation between RBC and HGB values (r=.440 p<0.01).

According to Table 3; the mean weight of overweight and obese female individuals was 81,3kg; BMI averages 31,3%; Glucose Starvation averages 94,7; Cholesterol averages 194,8; Triglyceride averages were 125,4; Vitamin B12 averages were 296,3; WBC averages of 8,2; RBC means 4,9; It is seen that the mean of HGB is 13,1 and the mean of Insulin is 3,4.

Table 3: Average Values of Overweight and Obese Female Individuals

	N	Mean	Std. Deviation
Kilo	51	81,3529	14,98965
Bmi	51	31,3133	4,95938
Glucosestarvation	51	94,7647	9,97314
Gholesterol	51	194,8020	46,27440
Trigliserid	51	125,4627	84,42337
VitaminB12	51	296,3078	136,42365
WBC	51	8,2684	1,98827
RBC	51	4,9065	,54409
HGB	51	13,1963	1,50487
Insulin	51	3,4827	2,41158

Table 4: Relationship Values of Overweight Female Individuals

			1	2	3	4	5	6	7	8	9	10
1	Kilo	Pearson Correlation	1									
		Sig. (2-tailed)										
2	Bmi	Pearson Correlation	,909**	1								
		Sig. (2-tailed)	,000									
3	Glucose Starvation	Pearson Correlation	,382**	,504**	1							
		Sig. (2-tailed)	,006	,000								
4	Cholesterol	Pearson Correlation	-,040	-,017	,164	1						
		Sig. (2-tailed)	,778	,908	,249							
5	Trigliserid	Pearson Correlation	,160	,216	,180	,332*	1					
		Sig. (2-tailed)	,262	,128	,206	,017						
6	VitaminB12	Pearson Correlation	-,273	-,234	-,131	-,042	-,257	1				
		Sig. (2-tailed)	,053	,099	,360	,770	,069					
7	WBC	Pearson Correlation	,213	,272	,052	-,260	,089	-,025	1			
		Sig. (2-tailed)	,133	,054	,716	,066	,534	,862				
8	RBC	Pearson Correlation	,095	,118	,208	-,232	,010	-,105	,204	1		
		Sig. (2-tailed)	,505	,411	,144	,102	,945	,465	,152			
9	HGB	Pearson Correlation	,188	,159	,024	,133	,094	-,143	,187	,260	1	
		Sig. (2-tailed)	,186	,265	,865	,352	,511	,317	,190	,066		
10	Insulin	Pearson Correlation	,377**	,436**	,400**	,293*	,619**	-,394**	,153	-,049	,085	1
		Sig. (2-tailed)	,006	,001	,004	,037	,000	,004	,284	,731	,554	

** p<0.01 *p< 0.05

According to Table 4; Between Weight and Bmi values (r=.909 p<0.01), between Weight and Glucose Starvation values (r=.382 p<0.01), and Weight and Insulin values (r=.377 p<0.01) of female individuals of a significant positive relationship between; There was a significant positive correlation between Bmi values and Glucose Starvation values (r=.504 p<0.01) and between Bmi and Insulin values (r=.436 p<0.01); There was a significant positive correlation between Glucose Starvation and Insulin values (r=,400 p<0.01); A positive significant relationship between Cholestrol and Triglyceride values (r=.332 p<0.05) and between Cholestrol and Insulin values (r=.293 p<0.05); It is seen that there is a positive and significant relationship between Triglyceride and Insulin values (r=,619 p<0.01), and a negative significant relationship between Vitamin B12 and Insulin values (r=,-394 p<0.01).

DİSCUSSİON

When the mean blood values of overweight and obese male individuals are examined in Table 1, it was determined that cholesterol and triglyceride levels were above the reference values. It is also seen that Glucose Starvation and Insulin levels are very close to the risk level. It can be said that the main reason for this may be due to excessive internal lubrication due to obesity. He worked in the American Hospital between 1990 and 1993 in Turkey with Prof. Dr. In a study conducted by Robert W. MAHLEY and his team in 196 adult male and 210 adult female volunteers in Istanbul, the negative effects of high Bmi on blood lipids were determined. It has been stated that as the Bmi values increase towards the levels of 25 to 30 kg/m2 (obese), the total cholesterol, LDL-C and triglyceride values increase significantly.

According to Table 2; It has been determined that there is a positive and significant relationship between the weight and BMI of overweight and obese individuals. Accordingly, we can say that bmi is a measure directly proportional to weight. Individuals with a high weight value also have high BMI values. Again, according to the table, it has been determined that there is a positive and significant relationship between Bmi value and glucose starvation and insulin. Accordingly, it can be said that obesity has an effect on glucose starvation and insulin and increases these values. According to the table, it has been determined that there is a positive and significant relationship between glucose starvation values and insulin and Wbc. Accordingly, it can be said that glucose starvation values affect insulin value and Wbc. By looking at the averages in Table 1, we can interpret that these values affect each other up or down in parallel, as both values reach the upper limit of the reference value. According to the table, it has been determined that there is a positive and significant relationship between cholesterol and triglyceride and insulin. By looking at the averages in Table 1, we can interpret that these values affect each other up or down in parallel, since both values reach the upper limit of the reference value. We can say that the triglyceride and insulin levels of individuals also increase as a result of excess weight increasing cholesterol. According to the table, it was determined that triglyceride had a positive and significant relationship with insulin. Accordingly, we can say that when the triglyceride level increases in obese male individuals, the insulin level also increases by looking at the average values in Table 1. According to the table, it has been determined that there is a negative significant relationship between Vitamin B12 and insulin. Accordingly, we can say that the insulin level decreases as the Vitamin B12 level rises in overweight and obese individuals, and the insulin level increases as the Vitamin B12 level decreases. According to the table, it was determined that WBC had a positive and significant relationship with HGB. WBC (White blood cell, Leukocyte) plays an important role in the production of HGB (Hemoglobin, Total blood amount). For this reason, we can say that WBC, which plays an important role in the body's immune system, has a positive or negative effect on the total blood amount of individuals. Finally, according to the table, it has been determined that there is a positive and significant relationship between RBC (Erythrocyte, Red blood cell) and HGB (Hemoglobin). Accordingly, we can say that Erythrocytes play an important role in regulating the level of total blood amount.

When the mean values of overweight and obese female individuals were examined in Table 3, it was determined that the blood values were at normal levels.

According to Table 4; In overweight and obese women, it was determined that there was a positive significant relationship between Weight and Bmi, Glucose Starvation and Insulin. Accordingly, we can say that weight has a parallel effect on Glucose Starvation and Insulin. According to the table, it was determined that there was a positive and significant relationship between Bmi and Glucose Starvation and Insulin. Accordingly, we can say that high Bmi values increase Glucose Starvation and Insulin, or low Bmi values decrease these values. According to the table, it has been determined that there is a significant positive correlation between Glucose Starvation value and Insulin. According to this result, it can be said that the Glucose Starvation value has an effect on the insulin value. We can say that if Glucose Starvation rises, the amount of insulin of the individual may increase, or on the contrary, if the amount of Glucose Starvation decreases, the insulin level may decrease. According to the table, it has been determined that there is a positive and significant relationship between Cholesterol, Triglyceride and Insulin. According to this result, we can say that an increase or decrease in the amount of cholesterol in overweight and obese women may affect Triglyceride and Insulin levels positively or negatively. According to the table, it has been determined that there is a positive and significant relationship between Triglyceride and Insulin. In this respect, we can say that a high or low triglyceride level will affect the amount of insulin in the blood in a positive or negative way in parallel. Finally, according to the table, it has been determined that there is a negative significant relationship between Vitamin B12 and Insulin in overweight and obese women. According to this result, we can say that a decrease in the rate of Vitamin B12 in the blood may increase the amount of insulin or an increase in Vitamin B12 may decrease insulin.

Carey et al., in their study, state that when the Bmi level rises from twenty percent to thirty percent, the risk of diabetes increases 11 times.[19]

Herishanu et al (2006) analyzed patients (n = 327) referred to their outpatient hematology clinic for persistent leukocytosis and found that 15% were asymptomatic, obese, mostly middle-aged females with a mild leukocytosis (mean white blood cell count 13.05 ± 1.4410^9/L) characterized mostly by neutrophilia without bandemia and accompanied by elevated acute-phase reactants (CRP and erythrocyte sedimentation rate).[21] In the study of Ciğerli and friends (2016), it was revealed that vitamin D, B12 and folic acid levels are low in non-diabetic obese patients, and low vitamin D and B12 levels are associated with insulin resistance.[23]

CONCLUSİON

As a result, according to the research data, it has been determined that the body blood parameters of obese men and women negatively affect each other in a way that threatens health, depending on obesity. In order to prevent these risks to health, it is inevitable for individuals to apply a balanced diet together with regular exercis

REFERENCES

1. Bezci, S. and Kaya, Y. (2010). Investigation of Some Biochemical Parameters Before and After Training in Elite Female Taekwondo Players, Pamukkale Journal Of Sport Sciences, Vol. 1, no. 2, Pg:1-16.
2. Wu, H.J., Chen, K.T., Shee, B.W., Chang, H.C., Huang, Y.J., Yang, R.S. (2004). Effects of 24 hour ultra-marathon on biochemical and hematological parameters, World J. Gastroenterol. 10(18):2711-2714.
3. Awodu OA and Famodu AA. (2007). Effects of Exercise on Hemorheological Parameters of Young Nigerian Smokers, Turk J. Med. Sci. 37 (1): 11-16.
4. Wilson, P.W., D'Agostino, R.B., Sullivan, L., Parise, H., Kannel, W.B. (2002). Overweight and obesity as determinants of cardiovascular risk: the Framingham experience. Arch Intern Med. Sep. 9;162(16):1867-1872.
5. Uzuner, K. and Sonmez, G.A. (2009). Acute Effect of Exercise on Blood Parameters in Footballers, II. Exercise Physiology Symposium; Dokuz Eylul University Faculty of Medicine, P16, Izmir. 78:42.
6. Karahasanoglu, A. (2011). "The Effect of Acute and Regular Exercise on Biochemical Parameters". Erciyes University, Faculty of Pharmacy. Final project. Kayseri.
7. Ozder, A. (2014). Lipid profile abnormalities seen in T2DM patients in primary healthcare in Turkey: a cross-sectional study. Lipids Health Dis. 6; 13-183.
8. Mahato, R.V., Gyawali, P., Raut, P.P., Regmi, P., Singh, K.P., Pandeya, D.R., et al. (2011). Association between glycaemic control and serum lipid profile in type 2 diabetic patients: glycated haemoglobin as a dual biomarker. Biomed Res. 22: 375-80.
9. Satman, I., Omer, B., Tutuncu, Y., Kalaca, S., Gedik, S., Dinccag, N., et al., TURDEP-II Study Group. (2013). Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. Eur J Epidemiol. Feb. 28(2):169-180. doi: 10.1007/s10654-013-9771-5.
10. Syvanne, M., Taskinen, M.R. (1997). Lipids and lipoproteins and coronary risk factors in non-insulin dependent diabetes mellitus. Lancet. 350(Supp 1): S120-3.
11. Smith, S.R. (1996). Obesity: The endokrinology of obesity. Endokrinology and Metabolism Clinics of North America. 25: 921-42.
12. Ozdogan, E., Ozdogan, O., Guldal Altunoglu, E., Koksal, A.R. (2015). "Association of blood lipid levels with Hba1c and obesity in type 2 diabetes patients." The Medical Bulletin of Şişli Etfal Hospital, Volume: 49, Number 4. Istanbul.
13. Mahley, R.W., Palaoğlu, K.E., Atak, Z., Dawson-Pepin, J., Langlois, A.M., Cheung, V., et al. (1995). Turkish Heart Study: Lipids, lipoproteins, and apolipoproteins. J Lipid Res. 36: 839-59.
14. Pasalı, Kilit ve ark., (2020). "Evaluation of the Relationship Between Obesity and Hematological Parameters Associated with Atherosclerosis. TJFMPC www.tjfmpc.gen.tr 14; (3).
15. Satman, I., Yilmaz, T., Sengül, A., Salman, S., Salman, .F, Uygur, S., et al. (2002). Population-based study of diabetes and risk characteristics in Turkey: results of the turkish diabetes epidemiology study (TURDEP). Diabetes Care. Sep. 25(9):1551-1556.
16. Howell, K.R., Powell, T.L. (2017). Effects of maternal obesity on placental function and fetal development. Reproduction. 153(3):97-108.
17. Spyridopoulos, T.N., Dessypris, N., Antoniadis, A.G., Gialamas, S., Antolopoulos, C.N., Katsifoti, K., et al. (2012). Insulin resistance and risk of renal cancer. A case control study. Hormones. 11:308-15. 51. Ma J, Li H, Giovanucci E, M.
18. Savas, H.B., Gultekin, F. (2017). Insulin Resistance and Clinical Significance. Med J SDU / SDÜ Tıp Fak Derg. 24(3):116-125.
19. Carey, V.J., Walters, E.E., Colditz, G.A., Solomon, C.G., Willet, W.C., Rosner, B.A., Speizer, F.E., and Manson, J.E. (1997). Body fat distribution and risk noninsulin-dependent diabetes mellitus in women. The Nurses Health Study. Am J Epidemiol. 145: 614-9.
20. Baskin, Y. et al. (2008). "Lipoprotein (a) and Lipid Parameters in Adult Overweight and Obese with Insulin Resistance". Turkish Journal of Clinical Biochemistry. 6(2): 65-71.
21. Herishanu, Y., Rogowski, O., Polliack, A., Marilus, R. (2006). Leukocytosis in obese individuals: possible link in patients with unexplained persistent neutrophilia. Eur J Haematol. 76(6): 516-520.
22. Hotamisligil, G.S., Shargill, N.S., Spiegelman, B.M. (1993). Adipose expression of tumor necrosis factor-alpha: direct role in obesity-linked insulin resistance. Science. 259(5091): 87- 91.
23. Cigerli, O., Parildar, H., Doğruk Unal, A., Cinnamon, O., Kut, A., Eroğlu, H., Güvener, N. (2016). "Vitamin Deficiency and Insulin Resistance in Non-Diabetic Obese Patients". Acta Endo (Buc). 12 (3): 319-327.
24. Turkay, I.K., Suna, G. (2020). "Examination of Body Mass Indexes, Blood Glucose, Hemoglobin A1C and Insulin Resistance Levels of Individuals Applying to Sports Center". International Journal of Applied Exercise Physiology, Asian Exercise and Sport Science Association 9:5. 248-252.