



Effect of eating sugars, excessive red meat intake and overweight on some immune factors

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Abstract

The most common cause of diseases is the weakness of the immune system. Some of them can be harmful, and everyday behavior and habits, such as those in the study. In the study, kind and amount of food consumed, are among the major factors influencing the immune system. 76 samples were collected from healthy people in Nineveh, including 37 males and 39 females with ages 15-59 years. Information was recorded for each person (gender, age, type's chronic disease, infected with COVID-19). CBC parameters are measured by Auto Hematology Analyzer machine, the biochemical device used to measure IgG and IgM. Eating sugar a lot had a detrimental effect on the level of IgG, which averaged 614 mg/dl and the number of lymphocytes was 1.96×10^3 , in addition to its negative effect on the activity of the complement which reached 13.17%. Excessive consumption of red meat led to a decrease in the level of IgM which averaged 129 mg/dl, and a decrease in the levels of WBC and granulocyte, as their levels reached 6.06×10^3 and 3.75×10^3 respectively. The persons who were overweight had a clear effect on the decrease in the level of IgM which averaged 105.2 mg/dl and on complement activity as it is level reached 12.2%.

Keywords: IgG, IgM, Sugar, Red Meat, Overweight.

Introduction

The immune system is a complex and sophisticated network of specialized tissues, organs, cells, and proteins that have evolved in order to protect the host from a range of dangerous agents (such as bacteria, viruses, fungi, and parasites). There is a close relationship between nutritional status and immune function, and immune efficiency can be considered a measure of adequate nutrition and healthy daily behavior (Maggini et al., 2017).

Excessive intake of sugar leads to suppression of the immune system, weak white blood cell functions, and imbalance of vitamins and elements in the body, also leads to overweight and obesity, which negatively affects the immune system (Misra et al., 2016). Obesity is an abnormal accumulation of fat in adipose tissue stores, the obesity has deleterious effects on the immune system, increasing the severity of infections and decreasing the immune system's ability to produce

antibodies (De Bandt & Monin, 2021). Obesity disrupts the function of neutrophils. Indeed, an elevation in the basal state of the production of ROS, the superoxide anion, is observed. The neutrophils of obese subjects are therefore already activated in the basal state (Cani et al., 2007).

Sugar intake also affects the humoral immune response and lowers antibodies (Rahiman & Pool, 2016). High blood sugar levels suppress the response of neutrophils and phagocytes, two types of immune cells that help protect against infection (Jafar et al., 2016).

Red meat is an important dietary source of protein and essential nutrients including iron, zinc, and vitamin B12, but recent reports suggest that consuming it in excess may increase the risk of cardiovascular disease (McAfee et al., 2010). The high acidity of red meat may weaken the immune system, and remember that consuming a lot of acidic foods may lead to an increase in the overall pH load in the body, and

this leads to minerals such as magnesium, calcium, potassium, and bicarbonate becoming low, which negatively affects public health. For the body, especially the immune system (Moneco Emily, 2021). Health experts advise not to eat more than 70 grams (cooked weight) of red meat per day, as some meats contain a high percentage of saturated fats, which may raise the level of cholesterol in the blood (Williamson et al., 2005).

Materials and Methods

This study is done on healthy persons in Mosul city by using tests to assess their immune systems. Total of 76 blood samples were collected with ages ranging from 15-59 years. The samples included 37 males and 39 females. The person’s information was recorded in a special form that included questions about health, food, and lifestyle. Samples were taken from a group of people with a healthy diet and healthy lifestyle, a group of people who eat excessive sugar, a group of people who eat excessive red meat, and a group of overweight people.

Preparation of blood serum

5 ml of venous blood was withdrawn using a sterile medical syringe. The blood sample was divided into two parts: The first blood sample 3ml was placed in a clean, sterile gel tub, and left for half an hour until clotting and separating the serum in a centrifuge at 3000 rpm for 10 minutes. It was distributed on several small plastic Eppedroff tubes and kept at 20°C until the next step. The second blood sample 2ml was placed in a clean, sterile in anticoagulant tube. IgG and IgM were measured by using a biochemical device. When anti-IgG or Anti-IgM antibodies are mixed with serum samples containing IgG or IgM or zinc, insoluble immune

complexes will form that appear as turbidity in the reaction solution, which is measured by a turbid meter at the wavelength (578 and 340) and proportional to the intensity of turbidity is directly related to the concentration of antibodies in the sample (Rifai, 2018).

WBC, Lymphocyte, and Granulocyte were measured by using an Auto Hematology Analyzer provided by Rayto RT-7600 to apply complete blood count, using anticoagulant tubes containing 2ml of whole blood and then enter the metal needle of the device in the tube within a minute. The result will appear on the device screen.

Complement activity test

E. coli (as an antigen) where the activity of the complement was determined by its ability to kill bacterial cells. After the incubation period when grown on a solid medium, the counting of bacterial cells was done with the control samples (without the presence of complement).

Statistical analysis

SPSS version 25 was used to complete the statistical analysis. Pearson test was used to find out the correlations and significance between parameters under study with both P values 0.01 and 0.05.

Results and Discussion

Table 1. shows the effect of excessive sugar intake on immune factors, as the study subjects were divided into two groups, the first group consuming a lot of sugars (68.4%) and the second group consuming little sugars (31.6%).

Table 1. Effect of eating too much sugar on the studied immune factors.

They eat a little sugar 31.6%		They eat a lot of sugar 68.4%		Normal Value	Immune Parameter
S.D	Mean	S.D	Mean		
43.57	673.3±8.89	31.47	614.4±4.64	(700- 1600) mg / dl	IgG
46.62	139.00±9.94	59.03	135.66±8.43	(40 - 230) mg / dl	IgM
1.23	6.69±0.26	1.32	6.24±0.19	(4 - 10) 10 ³ / L	WBC
0.83	2.19±0.19	0.89	3.70±0.13	(2 - 7.8) 10 ³ / L	Granulocyte
1.13	4.50±0.25	0.43	1.96±0.06	(2 - 5) 10 ³ / L	Lymphocyte
9.48	20.92±2.99	5.66	13.17±1.01	(13 -20) %	Complement

The average IgG was 614.4 mg/dl in the first group and 673.3 mg/dl in the second group, with a clear effect of excessive sugar intake on the IgG rate. And there was a clear decrease in the number of lymphocytes in people who eat sugars excessively compared with the second group, as it appeared at

a rate of 1.96 and 4.50 in the two groups, respectively. Excessive intake of sugars had a clear effect on the effectiveness of the complement activity, as it appeared at a rate of 13.17% in the first group, compared with the second group which showed a rate of supplement effectiveness at a

rate of 20.92%. Studies indicate that excessive intake of sugars negatively affects many of the functions of the body and its organs, including the immune system, as it leads to suppression of the immune system, weakness in white blood cell functions, and an imbalance of vitamins and elements in the body, as well as excessive intake of sugars, leads to obesity, which negatively affects the immune system. The study of the scientist (Shomali et al., 2021) and his colleagues showed that a high intake of sugar leads to a weakening of the immune system and an excessive production of pro-inflammatory cytokines. The study (Rahiman & Pool, 2016) of the scientist and his colleagues, which included groups of mice that were fed with molasses and control groups without a dose, demonstrated the effect of molasses in reducing the levels of IgG antibodies in the dosed mice compared to the control groups. It also indicated that molasses negatively affects the humoral immune response.

Table 2. illustrates the effect of excessive meat intake on the studied immune factors, the people were divided into two groups, the first group included 28.9% of people who ate meat more than 5 times a week, and the second group included 71.1% of people who ate little meat. The average IgG was 651.5 mg/dl and 657.6 mg/dl in the first and second groups,

respectively, which indicates the effect of eating meat a lot on the decrease in the amount of IgG compared to those who eat meat moderately. The IgM level appeared at 129 mg/dl in the people who eat meat a lot and at a rate of 181.45 mg/dl in the other group, which reflects the effect of eating meat on the IgM rate as well. The results also showed that people who ate meat moderately (less than 5 times a week) had an increase in the rates of white blood cells, lymphocytes, and granulocytes compared to people who ate meat more than 5 times a week who showed lower rates in the counts of white blood cells and cells. Lymphocytes and granulocytes. The rate of complement activity decreased in the first group compared to the second group, as they had a higher rate of complement efficacy. The study (Moneco Emily, 2021) confirmed that the high acidity that is characteristic of red meat may weaken the immune system, and remember that consuming a lot of acidic foods may lead to an increase in overall body pH load, which leads to minerals such as magnesium, calcium, potassium, and bicarbonate becoming low, which negatively affects health. The general body of the body, especially the immune system, and red meat is rich in fatty acids and Omega 6, and then eat it in abundance due to increase of inflammation in the body.

Table 2. Effect of excessive meat intake on the studied immune factors

They eat meat in moderation 71.1%		They eat too much meat 28.9%		Normal Value	Immune Parameter
S.D	Mean	S.D	Mean		
45.99	657.62±10.03	40.45	651.5±5.50	(700-1600) mg / dl	IgG
75.63	181.45±19.52	46.86	129.00±6.56	(40 - 230) mg / dl	IgM
1.32	7.58±0.32	1.22	6.06±0.17	(4 - 10) 10 ³ / L	WBC
1.06	4.43±0.23	0.98	3.75±0.13	(2 - 7.8) 10 ³ / L	Granulocyte
0.56	2.34±0.12	0.46	1.83±0.06	(2 - 5) 10 ³ / L	Lymphocyte
7.96	14.22±1.43	6.81	15.63±1.96	(13 - 20) %	Complement

Table 3. shows the effect of weight gain on the studied factors. There was an increase in the rates of both IgG and IgM in people of normal weight, which amounted to 646.6 mg/dl and 164.9 mg/dl, respectively, compared to people who had an increase in weight. And the white blood cell rate appeared at 6.51x10³ cells/liter and 6.43x10³ cells/liter in the first and second groups, respectively, which indicates that excess weight affects little and negatively on the rate of white blood cell count. Also, the average granulocyte count was 4.22x10³ cells/liter in people of normal weight compared to people with excess weight, which appeared in them by 3.95x10³ cells/liter, while similar levels appeared in the rates of lymphocytes in the amount of 2.5x10³ cells/liter and 2.00x10³ cells/liter in the first and second groups, respectively. The scientist (Mahassni, 2020) and his colleagues observed a slight increase in the rate of the number of white blood cells, lymphocytes, and some granulocytes for people with overweight compared to normal weight in a study conducted in the Kingdom of Saudi Arabia in 62 healthy women who suffer from any chronic diseases,

and this It is consistent with our results that we obtained, as the scientist (Paich et al., 2013) and colleagues observed a decrease in the levels of CD8 + and CD4 + T cells in overweight people compared to people of normal weight in his study conducted in the United States of America (North Carolina) On 454 participants with normal weight and overweight and others suffering from obesity, it was noted that overweight and obese people have a weak immune response against diseases compared to people with normal weight. The scientist (Jamshidi & Seif, 2017) and his colleagues also indicated that an increase in the white blood cell count was associated with an increase in weight compared to people of normal weight in the study conducted in Iran, which included 486 people, 254 males, and 232 females. White blood cells and platelets have them. The complement activity appeared by 18.07% in the first group, while it appeared by 12.20% in the second group, which reflects the negative effect of excess weight on the effectiveness of the supplement, and we did not reach to study the effect of excess weight on the effectiveness of the supplement for the purpose of comparison.

Table 3. Determining the effect of weight gain on the immune system

Overweight 26.3%		People of normal weight 73.7%		Normal Value	Tests
S.D	Mean	S.D	Mean		
41.56	633.27±9.79	39.38	646.6±5.26	(700-1600) mg/dl	IgG
24.82	105.20±5.69	62.67	164.94±9.04	(40 - 230) mg/dl	IgM
1.42	6.43±0.34	1.24	6.51±0.17	(4 - 10) 10 ³ / L	WBC
0.85	3.95±0.20	1.02	4.22±0.14	(2 - 7.8) 10 ³ / L	Granulocyte
0.56	2.00±0.12	0.46	2.05±0.06	(2 - 5) 10 ³ / L	Lymphocyte
4.23	12.20±1.27	8.41	18.07±1.59	(13 - 20) %	Complement

Conclusions

Eating a lot of sugar had a clear effect on all immune parameters, while excessive consumption of red meat had less effect, and being overweight was the least effect in healthy people.

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

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