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Article

Determine The Effectiveness Of Balance In The Gut Microbiome And Some Blood Parameters In Obese Donors In Iraq

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Abstract: The current study aimed to evaluate the relationship between intestinal bacteria and some blood parameters in some cases of obesity in Iraq. The study included 60 samples. Their ages ranged from both sexes (20-64) years (40) samples of people suffering from obesity (Obesity Group) after confirming by measuring weight and height and extracting the value of the Body Mass Index (BMI) and (20) samples of people with ideal weight as a control group (Control Group). The study found that obese donors had decreased values of the parameters of mean red blood cell volume, packed red blood cell volume, hemoglobin, and red blood cells, while obese donors had increased values of platelets, white blood cells, neutrophils, and lymphocytes. The results showed that obese donors had increased values of alanine aminotransferase, aspartate aminotransferase, and alkaline phosphatase.It was also noted through the results that there was an increase in the number of bacteria in the stool of obese people compared to the control group.

Keywords: Obesity, Hemoglobin, Platelets, White Blood Cells, ALT, AST

1. Introduction

Obesity:

The rates of overweight and obesity have increased dramatically and to varying degrees between different countries in Iraq. The percentage differed according to the study location, as studies conducted on samples living in the countryside showed a higher percentage of obesity than others. This is evident from the difference in obesity rates between governorates and the center. A study [1] showed that the obesity rate in Iraq for men and women is 8% and 19% respectively. In another study, the obesity rate (according to the body mass index) showed approximately 37% for both sexes [2].

Percentage of Packed Cell Volume (PCV%):

The percentage of the volume of circulating blood cells is defined as the volume of packed or packed blood cells. A healthy organism's packed cell volume is directly correlated with its hemoglobin and red blood cell content; a rise in PCV value corresponds with an increase in red blood cell count or a decrease in plasma volume [3].

Hemoglobin (Hb):

Hemoglobin is of great importance in the body of living organisms, including humans, since it plays a significant role in the transportation of breathing gases and is a

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primary component of the majority of red blood cell components. Its quantity varies according to gender, as it ranges from (16-14 g/ml) in males and (14-12 g/ml) in females. A low level of Hb is considered an indicator of anemia [4].

Platelets (PLT):

Small particles that do not contain a nucleus at all stages of their formation. Their percentage in a healthy person is about (300,00) mm/cubic of blood. They originate from special cells known as megakaryocytes in the bone marrow. They play a significant role in the process of blood clotting. Platelets adhere to the damaged blood vessel wall to create a platelet plug when the vessel is wounded that causes the wound to close temporarily. Then, a group of compounds are secreted that cause clotting reactions that enhance and strengthen the plug [5].

White Blood Cells (WBC):

White blood cells are the main components of the body's multifaceted defensive mechanism and are distinguished by their capacity to traverse across tissues and perform a variety of immunological tasks. In a healthy adult, there are between 4000 and 11,000 of them per microliter [6].

Probiotics:

The human body hosts a large number of microbes, including bacterial and fungal microorganisms. There is an inherent connection between the gut macrobiotic and general health, including obesity risk. The makeup and function of the human gut macrobiotic are altered in particular ways in obesity and metabolic diseases associated with obesity. Research on mechanisms has demonstrated that the gut macrobiotic can impact both sides of the energy balance equation: it can change how well the diet utilizes energy and it can affect host genes that control energy storage and expenditure. Furthermore, the content of it varies and can be affected by various dietary components.

This fact presents the intriguing idea that altering the gut macrobiotic of individuals could aid in weight loss or help prevent obesity. Probiotics, or living bacteria, and oligosaccharides, or limited digestible dietary components, are examples of emerging treatments for the prevention and/or treatment of obesity that aim to restore or modify the composition of the macrobiotic [87] .Found in foods such as yogurt and dietary supplements, probiotics can be natural or pharmaceutical products containing live bacteria used to treat certain disorders and improve general health [,1019]. These bacteria grow in the digestive tract, especially the intestine, where they number up to four hundred species, of which 85% are acid-tolerant anaerobic Lactobacilli Bifid bacterium [11].

2. Materials and Methods

1- Hematology test

This type of examination has great medical importance as it helps in diagnosing many diseases. This examination has great medical significance as it gives a complete picture of the blood and its components. The blood examination using the Ruby device includes the following examinations: RBC, HGB, PLT, PCV, MCV.

Differential Counting of White Blood Cells. The percentage rate of each type of cells (Lymphocyte and (Neutrophill) was extracted, as the number of each type of cells was calculated within the hundred cells [12]..

2-Microbiological tests

Preparation of culture media:

The culture media were prepared according to the method of the manufacturer registered on the package. The culture media were sterilized in an autoclave at a temperature of 0120 C and under a pressure of 15 pounds / inch 2 for 15 minutes. The culture media were incubated after pouring into the dishes at a temperature of 037 C for 24 hours before use to ensure that they were free from contamination.

Estimation of total live bacterial count: The plate count Pour method was adopted for the purpose of estimating the total live bacterial count. Then, a series of dilutions were prepared up to 103 using sterile distilled water. 1 ml was transferred using a clean and sterile pipette from each dilution and from the original sample to sterile Petri dishes, after pouring the solid MacConkey medium and the previously prepared Lactobacillus MRS medium after its temperature reached 45-50°C. Then, the medium was stirred by rotating the dish gently in a circular manner with the medium in a good way, then left to solidify. After that, the dishes were incubated upside down at a temperature of 37°C for 24-48 hours in the incubator. A swab was taken by the bacterial carrier from the dilutions and inoculated on the medium for the first day. Then the plates were incubated in the incubator at 37°C for 24 hours under aerobic conditions, after which the plates were removed and the colony numbers were counted using a Colony Counter, which ranged from 300-300 colonies, and then the colony number was multiplied by the reciprocal of the dilution and expressed as CFU/100 ml[13]..

3. Results

The relationship between obesity and blood sugar and some blood variables

Table (1) shows blood sugar and some blood variables in donors with and without obesity.

Glucose concentration and blood parameters						
Parameters	Glucose mmol/L	RBC $cell^3$/ml	HGB g/ml	HCT %	MCV %	PLT pl/cmm
Control	85-110	4.90-6.10	13.8-15.9	41.6-48.8	80.2-89.3	182-273
Obese	95-120	4.60 -4.77	9.6-11.1	34.2-44.8	63.2 -75.8	200-290

Table (2) shows the white blood cells of the control group in donors with and without obesity.

parameters	WBC $cell^3$/ml	Neutrophill%	Lymphocyte%
Control	6.15-7.40	43.2-44.6	24.9-29.1
Obese	9.4-11.8	58.6-61.7	33.1-48.8

The relationship between obesity and liver functions

Table (3) shows the concentration of liver enzymes in donors with and without obesity.

Liver function parameters			
parameters	**ALT (U/L)**	**AST(U/L)**	**ALP(KAU/Dl)**
Control	**7-21**	**9-34**	**5.7-7.2**
Obese	**10-32**	**11-38**	**6.5-9.2**

Microbiological study

Table (4) shows the number of bacteria in the stool of the study subjects (dilution 5)

Parameters	MacConkey	MRS
Control	64-79	44-71
Obese	191-283	109-177

Table (5) shows the number of bacteria in the stool of the study subjects (dilution 6)

Parameters	MacConkey	MRS
Control	46-64	41-53
Obese	130-204	108-154

4. Discussion

The differences in the values of blood parameters in obese subjects compared to non-obese subjects are shown in Tables (1) and (2). The results showed that obese donors had decreased values of the parameters of mean red blood cell volume, packed red blood cell volume, hemoglobin, and red blood cells, which were in the range of 63.2 to 75.8, 34.2 to 44.8, 9.6 to 11.1, and 4.60 to 4.77, compared to their values in healthy donors, which were 80.2 to 89.3, 41.6 to 48.8, 13.8 to 15.9, and 4.90 to 6.10. While in obese donors, platelets, white blood cells, neutrophils, and lymphocytes were elevated, in addition to glucose, with values in the range of 9.4 to 11.8, 58.6 to 61.7, 33.1 to 48.8, and 95 to 120, while in non-obese donors, their values were in the range of 6.15 to 7.40, 43.2 to 44.6, 24.9 to 29.1, and 85 to 110.

The decrease in both red blood cells and platelets in the current study in obese individuals may be due to the direct effect of cholesterol on the process of blood cell formation and its cells in the bone marrow by inhibiting the stages of hemoglobin formation [14]. The reason for the decrease in red blood cells may also be the formation of Heniz bodies inside red blood cells due to free radicals resulting from high cholesterol concentrations, which cause the decomposition of red blood cells [15]. The decrease in some blood components in obese patients causes a decrease in the delivery of oxygen to the heart, and since in the case of anemia, the hemoglobin bound to oxygen decreases, the heart must work harder to meet the heart's need .Thus, there is a relationship between obesity, anemia, and heart disease [16].

The reason for the decrease in hemoglobin concentration is also due to the decrease in iron concentration resulting from low consumption through following a diet (and the diet is used to reduce the acceleration of the disease and delay the appearance of symptoms and signs of the disease and alleviate its severity [17].

Decreased hemoglobin leads to the production of inflammatory cytokines, and the more cytokinin there is, the less hemoglobin there is, which is due to the accumulation of fat inside the cells, oxidative stress, and the death of macrophages, which leads to the instability of the atherosclerotic plaque, causing anemia [18]. It was not observed from the results obtained that there were no differences between the sugar level in obese people and normal people because we excluded diabetic patients in this study, and it is consistent with [19].

The difference in the values of enzyme standards in obese people and their comparison with non-obese people are shown in Table (4-7). The results showed that obese donors had increased values of alanine aminotransferase, aspartate aminotransferase, and alkaline phosphatase, which were in the range of 10 to 32, 11 to 38, and 6.5 to 9.2, compared to their values in healthy donors, which were 7 to 21, 9 to 34, and 5.7 to 7.2. [21,22,20] indicated a relationship between high ALT levels and cardiovascular diseases, as people with high ALT levels are more susceptible to heart disease than those with normal ALT levels. Measuring the levels of liver enzymes ALP, AST, and ALT is used to assess the functional status of the liver. Therefore, hyperlipidemia due to obesity often causes liver damage and increases oxidative stress, which is accompanied by increased levels of ALT, AST, and ALP.

Estimating these enzymes provides an indicator of amino acid metabolism and an important indicator of liver function [23]. They are found in high concentrations in the cytoplasm. Although these two enzymes are present in other tissues of the body, the effectiveness of the liver ALT enzyme decreases, which is a more specific indicator of liver damage, because during liver damage, the function of the liver cells will be disturbed, causing the enzyme to leak through the plasma membrane, causing its level to rise in the serum and also causing the release of the AST enzyme in a similar manner and its decrease in the liver [24].

The bacterial counts in the stool of the study groups (obese and non-obese individuals) were calculated and it was found that there was an increase in the bacterial counts in the stool of obese individuals, where in the fifth dilution on MacConkey and MRS medium, respectively, it reached 191-283 and 109-177 compared to the control, where it was 64-79 and 44-71, and in the sixth dilution, the bacterial counts reached 130-204 and 108-154 compared to the control, where it was 46-64 and 41-53, respectively. The results of our current study are consistent with the study [25]. The higher bacterial counts in obese individuals compared to healthy individuals. Gut microbes are fundamentally linked to overall health, including the risk of obesity. Obesity and obesity-related metabolic disorders are characterized by specific changes in the composition and function of human gut microbes. Mechanistic studies have suggested that the gut microbiota can influence energy balance.

A factor influencing energy utilization from the diet and as a factor influencing host genes that regulate energy expenditure and storage. Furthermore, its composition is not constant and can be influenced by multiple dietary components. Our findings support the hypothesis that specific components of the fecal microbiota may be involved in body weight control, as we have consistently observed increased body fat content and insulin resistance in mice colonized with the gut microbiota of conventionally raised mice [26].

A significant decrease in the number of Bacteroidetes and a relative increase in the number of Firmicutes have been described in genetically obese mice compared to lean and wild-type animals fed the same diet, suggesting that the gut microbiota contributes to obesity [27].

5. Conclusion

The study showed that obese people had disturbed vital signs (blood parameters, liver enzymes) which may lead to future health problems. It was also noted that obese people had a higher percentage of bacterial numbers compared to the control group.

REFERENCES

[1] Badran, M. and Laher, I. (2011). Obesity in Arabic-Speaking Countries. Journal of Obesity, Volume 2011: 686430, 9 pages.

[2] Nwayyir, H. A., Mutasher, E. M., Alabid, O. M., Jabbar, M. A., Abdulraheem Al-Kawaz, W. H., Alidrisi, H. A., ... & Khazaal, F. A. K. (2023). Recommendations for the prevention and management of obesity in the Iraqi population. Postgraduate Medicine, 135(5), 425-439.

[3] Farooq, U., Idris, M., Sajjad, N., Lashari, M. H., Ahmad, S., Rehman, Z. U., ... & Hameed, S. (2023). Investigating the potential of packed cell volume for deducing hemoglobin: Cholistani camels in perspective. Plos One, 18(5), e0280659.

[4] Saragih, H., Pannyiwi, R., Marunung, H., Harfika, M., & Saputra, M. K. F. (2024). Pemeriksaan Hemoglobin (Hb) Kolaborasi Universitas Pertahanan RI Dengan PMI Kota Bogor. Sahabat Sosial: Jurnal Pengabdian Masyarakat, 2(3), 346-352.

[5] Hirayu, N., & Takasu, O. (2024). Exploring the Hemostatic Effects of Platelet Lysate-Derived Vesicles: Insights from Mouse Models. International Journal of Molecular Sciences, 25(2), 1188.

[6] Zhao, Y., Diao, Y., Zheng, J., Li, X., & Luan, H. (2024). Performance evaluation of the digital morphology analyser Sysmex DI-60 for white blood cell differentials in abnormal samples. Scientific Reports, 14(1), 14344.

[7] Peivasteh-Roudsari, L., Pirhadi, M., Karami, H., Tajdar-Oranj, B., Molaee-Aghaee, E., & Sadighara, P. (2019). Probiotics and food safety: an evidence-based review. Journal of Food Safety and Hygiene, 5(1), 1-9.

[8] Davis, C. D. (2016). The gut microbiome and its role in obesity. Nutrition Today, 51(4), 167-174.

[9] Soni, R., Tank, K., & Jain, N. (2018). Knowledge, attitude and practice of health professionals about probiotic use in Ahmedabad, India. Nutrition & Food Science.

[10] Gyawali, I., Zhou, G., Xu, G., Li, G., Wang, Y., Zeng, Y., ... & Jiang, Q. (2023). Supplementation of microencapsulated probiotics modulates gut health and intestinal microbiota. Food Science & Nutrition, 11(8), 4547-4561.

[11] Falfan-Cortés, R. N., Mora-Peñaflor, N., Gomez-Aldapa, C. A., Rangel-Vargas, E., Acevedo-Sandoval, O. A., Franco-Fernandez, M. J., & Castro-Rosas, J. (2022). Characterization and evaluation of the probiotic potential in vitro and in situ of Lacticaseibacillus paracasei isolated from tenate cheese. Journal of Food Protection, 85(1), 112-121.

[12] Rodak, D. F., Claspha, J., & Mt, S. H. (1995). Diagnostic Hematology. W. B. Saunders Company, Philadelphia. Pp:22, 106.

[13] Huang, Y., & Benson, D. R. (2012). Growth and development of Frankia spp. strain CcI3 at the single-hypha level in liquid culture. Archives of Microbiology, 194, 21-28.

[14] Michel, J. B., & Martin-Ventura, J. L. (2020). Red blood cells and hemoglobin in human atherosclerosis and related arterial diseases. International Journal of Molecular Sciences, 21(18), 6756.

[15] Banerjee, A., Dey, T., Majumder, R., Bhattacharya, T., Dey, S., Bandyopadhyay, D., & Chattopadhyay, A. (2023). Oleic acid prevents erythrocyte death by preserving haemoglobin and erythrocyte membrane proteins. Free Radical Biology and Medicine, 202, 17-33.

[16] Olsen, J., & Puri, K. (2022). Interpretation of oxygen saturation in congenital heart disease: fact and fallacy. Pediatrics in Review, 43(8), 436-448.

[17] Pasricha, S. R., Tye-Din, J., Muckenthaler, M. U., & Swinkels, D. W. (2021). Iron deficiency. The Lancet, 397(10270), 233-248.

[18] Zhang, J., Nie, C., Zhang, Y., Yang, L., Du, X., Liu, L., ... & Li, Q. (2024). Analysis of mechanism, therapeutic strategies, and potential natural compounds against atherosclerosis by targeting iron overload-induced oxidative stress. Biomedicine & Pharmacotherapy, 177, 117112.

[19] Nguyen, P. K., Lin, S., & Heidenreich, P. (2016). A systematic comparison of sugar content in low-fat vs regular versions of food. Nutrition & Diabetes, 6(1), e193-e193.

[20] Luo, J., Xu, L., Li, J., & Zhao, S. (2015). Nonalcoholic fatty liver disease as a potential risk factor of cardiovascular disease. European Journal of Gastroenterology and Hepatology, 27(3), 193-199.

[21] Abreu, I. C. M. E. D., Guerra, J. F. D. C., Pereira, R. R., Silva, M., Lima, W. G. D., Silva, M. E., & Pedrosa, M. L. (2014). Hypercholesterolemic diet induces hepatic steatosis and alterations in mRNA expression of NADPH oxidase in rat livers. Arquivos Brasileiros de Endocrinologia and Metabologia, 58(3), 251-259.

[22] Dehghani Firouzabadi, M., Poopak, A., Sheikhy, A., Dehghani Firouzabadi, F., Moosaie, F., Rabizadeh, S., & Esteghamati, A. (2024). Nonalcoholic fatty liver disease as a potential risk factor for cardiovascular disease in patients with type 2 diabetes: A prospective cohort study. International Journal of Endocrinology, 2024(1), 5328965.

[23] Umarani, V., Muvvala, S., Ramesh, A., Lakshmi, B. V. S., & Sravanthi, N. (2015). Rutin potentially attenuates fluoride-induced oxidative stress-mediated cardiotoxicity, blood toxicity and dyslipidemia in rats. Toxicology Mechanisms and Methods, 25(2), 143-149.

[24] Jaffar, H. M., Bader ul Ain, H., Tufail, T., Hanif, A., & Malik, T. (2024). Impact of silymarin-supplemented cookies on liver enzyme and inflammatory markers in non-alcoholic fatty liver disease patients. Food Science & Nutrition.

[25] Kasai, C., Sugimoto, K., Moritani, I., Tanaka, J., Oya, Y., Inoue, H., Tameda, M., Shiraki, K., Ito, M., Takei, Y., et al. (2015). Comparison of the gut microbiota composition between obese and non-obese individuals in a Japanese population, as analyzed by terminal restriction fragment length polymorphism and next-generation sequencing. BMC Gastroenterology, 15, 100.

[26] Ley, R. E., Turnbaugh, P. J., Klein, S., & Gordon, J. I. (2006). Microbial ecology: Human gut microbes associated with obesity. Nature, 444, 1022–1023.

[27] Ley, R. E., Bäckhed, F., Turnbaugh, P., Lozupone, C. A., Knight, R. D., & Gordon, J. I. (2005). Obesity alters gut microbial ecology. Proceedings of the National Academy of Sciences of the United States of America, 102, 11070–11075.