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# Ameliorative Role of Diet in some Immunological and Metabolic Indicators

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**ABSTRACT**

The study aimed to show the effect of diet in observing some immunological and physiological aspects of the human body. The study is divided into two parts; the first part includes the immunological markers that involve interleukins (IL1α, IL 17,) and high-sensitivity C-reactive protein (hs-CRP). The second part includes biochemical markers; Vitamin D, Total cholesterol, Triglyceride, HDL, LDL, and Calcium. These parameters were measured in blood from 120 volunteers and their age (34.5 ± 9. 13) for men, and (27.4 ± 7.74) for women. However, the current study included two groups: **Group - A** (Include men blood pre and post-diet), and **Group- B** (Include blood sample of women pre and post-diet). IL1α, IL 17, hs-CRP, and Vitamin D were measured by using Sandwich Enzyme-Linked Immune-Sorbent assay technique (ELISA) while Total cholesterol, Triglyceride, HDL, LDL, and calcium were estimated by using the enzymatic colorimetric method. The average weight for men were (pre-diet = 94.1 ± 7.74; post-diet = 79.1 ± 12.8) while for women were (pre-diet = 78.3 ± 13.7; post-diet = 66.1 ± 10.3). The study noted that there is a statistically significant difference between groups ($p<0.05$) for the following indicators: Vitamin D, Total cholesterol, and group B for calcium assay. The study revealed that the results were non-significant between groups for parameters: IL1α, IL17, hs-CRP, Tg, HDL, and group A for calcium assay.

## 1. Introduction

A diet is a program to reduce weight, or it is a healthy program aimed to not increase body weight, so healthy food is what nutrients are consumed in appropriate healthy proportions to support metabolic processes. Overuse of nutrients has a negative and reversible effect on the health of the individual and society [1]. The immune system consists of two main lines, the first line is innate immunity, and the second line is acquired immunity, and also each main type, is divided into other secondary types, which are cellular and humoral. Therefore, dietary modifications or dietary changes will have an impact on the mechanisms of immune reactions [2-3].

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Unfortunately, the issue of obesity has become a public health problem, as the occurrence of obesity leads to an increased risk of many diseases, including type -2diabetes and heart disease, in addition to many other health disorders. Following an organized diet that controls weight gain, with physical activity, as well as consuming antioxidants and vegetables, leads to a reduction in the incidence of obesity [4]. The presence of vitamin D within normal values in the human body leads to supporting and stimulating the immune system in combating and preventing diseases [5]. Vitamin D has a unique role in regulating natural and acquired immunity, and most of this role is on innate immunity, as the study proved that vitamin D leads to a decrease in the secretion of inflammatory markers (IL-6, IL-8, IL-1 beta, IL-17, TNF-alpha) in addition to (CRP) and that a deficiency of this vitamin leads to an increase in the secretion of pro-inflammatory cytokines [6-9].

Vitamin D has two sources, the first is the main source, as it is synthesized in the skin, and the second source is the sources of some plant and animal foods. In general, and through studies, it has been proven that vitamin D has an important role in most body systems [10-12]. In many studies, it has been proven that covering the skin by wearing clothes leads to preventing vitamin D production on the surface of the skin. It has also been proven that people who work in highly polluted areas and northern latitude areas, and people who work night shifts must obtain more quantities of vitamin D through food or from other sources [13-14]. There is a relationship between metabolic disorders and vitamin D deficiency, and it was also found in some autoimmune diseases and chronic conditions such as arterial blood pressure and diabetes, as well as some types of cancers [15]. Obesity is either high-risk or low-risk and can be treated in several ways (Diet therapy, Exercise, Behavioral modification, and Weight loss surgery). There are many diseases associated with obesity and it is the cause of many health problems (Physical disability, Cardiovascular Diseases, Diabetes mellitus syndrome, Obstructive sleep apnea, Cancer-uterus, Cancer-colon, Cancer-breast, Cancer-prostate, Osteoarthritis, Asthma, Gout, Depression, Hypertension, A metabolic disorder, and Low life expectancy) [16]. For many reasons related to diet and vitamin D, they're related to human health, for example, dental and bone health, furthermore protection from a wide range of diseases and disorders related to physiological processes. As a result, this research will focus on diet and its role in the positivity and negativity aspects of some medical parameters.

## 2. Material and Methods:

### 2.1 Ethical research

The study was carried out at Baghdad Governorate / Medical City Hospitals / Bab Al-Moadham. The protocol and procedures in the present study were checked and accepted by the medical laboratory science departments' scientific committee and the director of the research Centre at the University of Raparin.

### 2.2 Experimental design

This study involved two parts, the first one is study the immunological markers, through which some immunological parameters were measured, and the second study included some biochemical aspects. The number of participants in the study was 120 participants. The study groups are shown as **Group A** (before and after diet - men), and **Group B** (before and after diet – women).

### 2.3 Methods

The blood samples were collected from men and women volunteers at laboratories of Medical City Hospitals. The centrifugation at 1000 g for 35 minutes at room temperature was used in the separation of the sera from the blood. The samples were prepared and held at a temperature of (-20°C). Sandwich Enzyme-Linked Immune-Sorbent assay technique was used to measure the concentration of (IL1α, IL 17, hs-CRP, and vitamin D. Furthermore, Total cholesterol, Triglyceride, HDL, LDL, and calcium were tested by using a spectrophotometer- enzymatic way (colorimetric method). The kits used in present study are vitamin D, IL-1α, IL-17, Total cholesterol, Triglyceride, HDL, hs-CRP and Calcium.

### 2.4 Statistical analysis

Statistical Package for Social Science (SPSS) V20 software package was used to carry out the statistical analysis. A one-way analysis of variance was used to evaluate the facts (ANOVA). P value (0.05) was determined statistically significant for all the findings.

## 3. Results and Discussion:

The mean age of the participants in the study was (34.5 ± 9. 13) for men while for women were (27.4 ± 7.74). According to weight, the means of pre and post-diet for men were (94.1 ± 7.74), (79.1 ± 12.8) respectively, while for women were (pre-die t= 78.3 ± 13.7; post-diet = 66.1 ± 10.3). For vitamin D, the means for men were (pre-diet = 29.1 ± 5.33; post-diet = 21.4 ± 4.62) while for women were (pre-diet = 22.1 ± 5.13; post-diet = 8.11 ± 1.72) as given in Table -1. Furthermore, the change in the inflammatory cytokines is linked to obesity [17]. Thus, the study demonstrated differences between groups but it did not

reach a significant level between the means of IL- α1 where for two groups of men and women were (pre-die t= 8.82 ± 1.93; post-diet = 9.18 ± 1.48), (pre-diet 12.7 ± 4.72; post-diet 13.1 ± 3.84) respectively, as shown in Table -2. Consequently, for IL-17 (pg/mL), the means of participants (men and women) were (pre-diet = 471.83 ± 47.6; post-diet = 475.91 ± 35.3) as for women (pre-diet = 448.92 ± 36.9; post-diet = 451.47 ± 43.7) as shown in Table -3. However, the study revealed that there are no statistically significant differences between the groups included in the current study. Regarding hsC-RP, the means pre and post-diet for men were (pre-diet= 2.81 ± 0.83; post-diet= 1.92 ± 0.29) and for women were (pre-diet = 2.09 ± 0.91; post-diet = 2.73 ± 0.18) as shown in Table -4. Also, there is no significant differences were observed between the groups. In addition, the changes in the concentrations of cholesterol are linked with diet [1]. Hence, lipid profiles were achieved, and the results showed a decreased level of cholesterol but not a significantly decreased where the means pre and post-diet for men and women were (pre-diet =, 174.1 ± 32.3; post-diet = 131.2 ± 19.6), (pre-diet = 142.6 ± 13.5; post-diet = 98.2 ± 11.2) respectively, according to Table- 5. As we mentioned above about cholesterol, triglycerides also decreased, but the decrease was not significant. Triglyceride, the means before and after the diet were for the participants in the study, for men were (pre-diet = 136.5 ± 14.7; post-diet = 97.5 ± 11.3) and also for women were (pre-diet = 113.1 ± 10.5; post-diet = 87.1 ± 9.11) and according to Table -6. In contrast to the HDL, the means before and after the diet were for the participants in the study, the means for men were (pre-diet = 36.3 ± 7.33; post-diet = 29.4 ± 4.16) for women were (pre-diet = 45.1 ± 5.51; post-diet = 39.3 ± 7.17) as given in Table -7. Finally, calcium and obesity have been linked to vitamin d disturbances [18] for that reason, serum calcium was performed, and the result showed higher a slight increase, but it was not statistically significant where the means before and after the diet were for the participants (men and women) respectively, were (pre-diet = 8.18 ± 0.38; post-diet = 10.7 ± 0.61) as for women were (pre-diet = 8.84 ± 0.69; post-diet = 10.9 ± 1.80) as shown in Table -8.

**Table (1):** The **means of vitamin D (ng/ml)**

| The participants | MEAN±SD (Pre-diet) | MEAN±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 29.1 ± 5.33 | 21.4 ± 4.62 | 0.013 |
| Group B | 22.1 ± 5.13 | 8.11 ± 1.72 | 0.018 |

**Table (2): The means of IL- α1 (pg/ml)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P-VALUE |
|---|---|---|---|
| Group A | 8.82 ± 1.93 | 9.18 ± 1.48 | 0.109 |
| Group B | 12.7 ± 4.72 | 13.1 ± 3.84 | 0.211 |

**Table (3): The means of IL-17 (pg/mL)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P-VALUE |
|---|---|---|---|
| Group A | 471.83 ± 47.6 | 475.91 ± 35.3 | 0.574 |
| Group B | 448.92 ± 36.9 | 451.47 ± 43.7 | 0.638 |

**Table (4): The means of hsC-RP (mg/l)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 2.81 ± 0.83 | 1.92 ± 0.29 | 0.109 |
| Group B | 2.09 ± 0.91 | 2.73 ± 0.18 | 0.091 |

**Table (5): The means of total cholesterol (mg/dl)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 174.1 ± 32.3 | 131.2 ± 19.6 | 0.003 |
| Group B | 142.6 ± 13.5 | 98.2 ± 11.2 | 0.027 |

**Table (6): The means of triglyceride (mg/dl)**

| The participants | MEAN±SD (Pre-diet) | MEAN ±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 136.5 ± 14.7 | 97.5 ± 11.3 | 0.067 |
| Group B | 113.1 ± 10.5 | 87.1 ± 9.11 | 0.071 |

**Table (7):The means of HDL (mg/dl)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 36.3 ± 7.33 | 29.4 ± 4.16 | 0.081 |
| Group B | 45.1 ± 5.51 | 39.3 ± 7.17 | 0.066 |

**Table (8): The means of calcium (mg/dl)**

| The participants | MEAN ±SD (Pre-diet) | MEAN ±SD (Post-diet) | P- VALUE |
|---|---|---|---|
| Group A | 8.18 ± 0.38 | 10.7 ± 0.61 | 0.139 |
| Group B | 8.84 ± 0.69 | 10.9 ± 1.80 | 0.050 |

Changes were significant (P<0.05) only for the following indicators: vitamin D, cholesterol, and group B for calcium testing as well, while for other indicators, the change was not significant. The present study shows us that vitamin D has a direct relationship with the stability of calcium concentration, which calcium is the main element in the formation of bones, as vitamin D contributes to the transfer of calcium from the small intestine to the blood, and then the calcium transfers to the bones. So Vitamin D deficiency leads to osteoporosis, and on the other hand, the presence of calcium in the blood that does not transfer to the bone may cause atherosclerosis. Vitamin D has important immunological effects, when the body has vitamin deficiency may lead to arthritis, also vitamin D has a beneficial hormonal activity to carry out immune modifications through its effect on Th1 and Th17 cells and thus reduces the production of

IL-1 and IL-17 [19,20]. Through previous studies, it was shown that vitamin D has an effect on the number of T-helper cells that produce inflammatory cytokines, and also works to increase anti-inflammatory cytokines through an increase in the density of Th2 [21,22]. Other studies suggested that vitamin D has a role in inhibiting Th1, by preventing the secretion of IL-1 and IL-6, and this leads to the conversion of Th1 to Th2, and thus the number of Th1 decreases and the number of Th2 cells producing anti-inflammatory cytokines increases[23-25]. Other results confirm that obesity has an effect on the levels of inflammatory and anti-inflammatory cytokines, and that physical activity has a clear importance in decreasing the levels of inflammatory cytokines and thus reduces the inflammatory effects in general, which may link obesity with insulin resistance and diabetes [26]. Many cytokines secreted by the adipocyte that present in the adipose tissue, and the case of obesity, the fat cells are many, and many of these cytokines produced by adipocytes lead to stimulation of inflammation, which leads to the mobilization of phagocytic cells in the adipose tissue. It can be concluded that obesity is the start of the occurrence of many diseases[27]. Based on these aforementioned mechanisms of obesity and vitamin D and which have a direct impact on human health were included in the current study as main factors. The study demonstrated that the results of the current study are a reinforcement of the role of diet in improving the health of individuals and agree with most previous studies.

## 4. Conclusion

Through the results of this study, it can be concluded that diet and vitamin D have a clear role in the parameters included in the present study, as the change was significant ($p<0.05$) for some aspects; Vitamin D, Total cholesterol, and group B for calcium assay, as well as a change occurred for other markers, IL1α, IL17, hs-CRP, Tg, HDL, and group A for calcium assay, but it did not reach the significant level.

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# الدور التحسيني للنظام الغذائي على بعض المؤشرات المناعية والأيضية

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**الخلاصة:**

هدفت الدراسة إلى بيان تأثير النظام الغذائي على بعض الجوانب المناعية والفسيولوجية لجسم الإنسان. تنقسم المؤشرات المدروسة إلى جزأين ، يتضمن الجزء الأول الجانب المناعي الذي يشمل الإنترلوكينات IL1α ، IL 17 ، والبروتين التفاعلي C عالي الحساسية (hs-CRP). الجزء الثاني يشمل ؛ فيتامين د ، الكوليسترول الكلي ، الدهون الثلاثية ، HDL، LDL والكالسيوم. حيث تم إجراء هذه الفحوصات على 120 متطوعًا و متوسط أعمارهم (34.5 ± 9. 13) للرجال و (27.4 ± 7.74) للنساء. تضمنت الدراسة مجموعتين: **المجموعة – أ** (الرجال قبل وبعد النظام الغذائي) ، **والمجموعة – ب** (قبل وبعد النظام الغذائي للنساء). تم قياس IL1α و IL 17 و hs-CRP وفيتامين D باستخدام تقنية المقايسة الامتصاصيّة المناعيّة للإنزيم المرتبط (ELISA) بينما تم تقدير الكوليسترول الكلي والدهون الثلاثية و HDL و LDL والكالسيوم باستخدام طريقة القياس اللوني الأنزيمي. حيث كان متوسط الوزن للرجال (قبل النظام الغذائي = 94.1 ± 7.74 ؛ بعد النظام الغذائي = 79.1 ± 12.8) بينما كان متوسط الوزن بالنسبة للنساء (قبل النظام الغذائي = 78.3 ± 13.7 ؛ بعد النظام الغذائي = 66.1 ± 10.3). أشارت الدراسة إلى وجود فروق ذات دلالة إحصائية بين المجموعات للمؤشرات التالية: فيتامين د ، والكوليسترول الكلي والمجموعة ب لفحص الكالسيوم وكذلك أوضحت الدراسة أن النتائج كانت غير معنوية ($p> 0.05$) بين المجموعات للفحوصات التالية: IL1α و IL17 و hs-CRP و Tg و HDL وكذلك المجموعة A لفحص الكالسيوم.

**الكلمات المفتاحية :** IL1α ,IL-17، hs-CRP، الوزن ، السمنة ، الدهون ، الكالسيوم