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Effect of food and supplements rich in folic acid, B12 and B6 on the level of homocysteine and lipid profile in rats.

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ABSTRACT

Hyprhomocysteinemia has been associated with an increased risk of atherosclerosis and other cardiovascular diseases. Vitamin B_6, B_{12} and folic acid are essential components in the metabolism of homocysteine. This study aimed to assess the effects of vitamin B_6, B_{12}, folic acid and the combination of them from supplemented and natural sources in the prevention of hyperhomhocysteine. The studies were carried out with 60 albino rats weighted range from (130 ±10 g) were purchased from national research center community (Doke). The rats were divided into main groups: The first main group include 6 rats were fed on basel diet, the second main group fed on basel diet methionine and divided into 9 sup groups treated with supplements (B_6, B_{12} and folic acid) or food (milk, meat and cowpea). The measure of Homocysteine, Heart enzymes, lipid profile, liver functions, Kidney functions and Histopathological examination of (liver, Kidney and Heart) were done. A dose of folic acid and mixture of B_6, B_{12} and folic acid in the high methionine diet it have a good effect on the level of homocysteine, heart enzymes in the serum of experimental rats and had effect on the lipid profile .This study showed that taking doses of foods and nutritional supplements containing B_6, B_{12} and folic acid in a diet high in methionine had an effect on reducing the level of homocysteine and heart enzymes and improving serum lipid profile in rats, so it is preferable that eating the diet contain foods rich in B_6, B_{12} and Folic acid could prevent and reduce diseases.

Key Words: B_6, B_{12}, Folic acid, Methionine, Homocysteine and Cardiovascular diseases**.**

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List of Abbreviations

Abb.	Full term
ALT	*Alanine aminotransferase*
AST	*Alanine aminotransferase*
BW	*body weight*
BWG	*body weight gain %*
FER	*Feed efficiency*
FI	*Feed intake*
CAD	*Coronary artery disease*
CVD	*Cardiovascular disease*
MET	*Methionine*
HCY	*Homocysteine*
CY	*Cysteine*
HHCY	*Hyperhomocysteinemia*
EFSA	*European Food Safety Authority*
WHO	*World Health Organization*
CK	*Creatine kinase*
CK-MB	*Creatine kinase-MB*
TC	*Total cholesterol*
TG	*Triglycerides*
LDL-c	*Low- density lipoprotein cholesterol*
HDL-c	*High- density lipoprotein cholesterol*
VDLD-c	*Very low density lipoprotein*
FA	*Folic Acid (folacin)*
Vit. B_{12}	*Cobalamin*
Vit. B_6	*Pyridoxine*
(AMI	*acute myocardial infarction*
SPSS	*Statistical Package for the Social Sciences*
Mg	*Milligram*
MI	*Milliliter*
Mg/dl	*Milligrams per deciliter*

List of Abbreviations (Cont…)

Abb.	Full term
5-FTHF	*5-formyltetrahydrofolate*
%	*Percentage*
µg/mL	*Microgram per Milliliter*
g/ l	*Gram per liter*
g	*Gram*
mmol/l	*Millimoles per deciliter*
RDA	*Recommended dietary allowances*
FDA	*Food and drug administration*
CDC	*Center for Disease Control*
T2D	*type-2 diabetes*
DNA	*Deoxyribonucleic acid*
RNA	*Ribonucleic acid*
UL	*Upper limit*
DV	*Dose of vitamin*
NTDs	*Neural tube defects*
THF	*Tetra hydro folic acid*
mcg	*Micrograms*
ESC	*The European Society of Cardiology*

1.INTRODUCTION

Cardiovascular diseases (CVDs), consisting of ischemic heart disease, stroke, heart failure, peripheral arterial disease, and a number of other cardiac and vascular conditions, constitute the leading cause of global mortality and are a major contributor to reduced quality of life in 2017, CVD caused an estimated 17.8 million deaths worldwide, corresponding to 330 million years of life lost and another 35.6 million years ***(Yang et al., 2020)***. According to the **WHO**, the most important risk factors of heart disease are an unhealthy diet physical inactivity, tobacco use and harmful use of alcohol the effects of behavioral risk factors are: hypertension, diabetes, hyperlipidemia, overweight and obesity ***(WHO, 2015).***

On the other hand, methionine has an increasing effect on HDL cholesterol, Proper balanced nutrition is one of the factors affecting human health throughout life to avoid injury of diseases should contain balanced food on all nutrients in quantities appropriate to the needs. But one of the main factors that have a direct role in heart disease is "homocysteine", which is a natural amino acid found in cells and plasma, and plays a major role in destroying the arteries of the body more than smoking, obesity or cholesterol itself. ***(Karakuła et al., 2009).***

Homocysteine metabolism stands at the intersection of two pathways: demethylations to methionine, which requires folate and vitamin B_{12} (or betaine in which is an important amino acid, due to a deficiency in folate and vitamin B_{12} and B_6 The body consists of the displacement of the methyl group of amino acid methionine and this process needs factors help without It does not convert an alternative reaction); and transculturation to cystathionine,

which requires pyridoxal-5′-phosphate. The two pathways are coordinated by S-adenosylmethionine, which acts as an allosteric inhibitor of the methylenetetrahydrofolate reductase reaction and as an activator of cystathionine β-synthase Hyperlipidemia and hyperhomocysteinemia are the major risk factors of CVDs ***(Obeid and Herrmann, 2009).***

High plasma homocysteine concentrations accompanying low concentrations of folate and vitamin B_6 (through their role in homocysteine metabolism), are associated with an increased risk of extra cranial carotid artery stenosis. ***(Abdul-Latif et al., 2013).***

Homocysteine is responsible for oxidation of the LDL cholesterol accelerating the development of the atherosclerotic plaques ***(Sierakowska-Fijałek et al., 2008)*** and info fences the processes of blood clotting by adhesion of blood platelets to the vascular endothelium ***(Karakula et al., 2009).***

The process of homocysteine re-methylation requires an adequate supply of folic acid, vitamin B_{12} and vitamin B6 ***(Biezanowska- kopec et al., 2012 and Lieu et al., 2008).***

2. AIM OF THE STUDY

The study aimed to investigate the effect of food and supplements rich in folic acid, B_{12} and B_6 on the level of homocysteine and lipid profile in rats Through the following determinations:

1- Methionine, homocysteine, heart enzyme (ck, ckmb).

2- Feed intake, FER and body weight gain % for rats.

3- Serum lipid profile including (serum total cholesterol, triglycerides, HDL-C: High-density lipoprotein, LDL-C: Low-density lipoprotein, VLDL-C: very-low- density lipoprotein).

4- Serum liver enzymes (AST Alanine aminotransferase).and ALT: Alanine aminotransferase).

5- Serum kidney enzymes (Urea, Creatinine and Uric acid).

6- Histopathological examination. (Liver, Kidney and Heart).

3- REVIEW OF LITERATURE

3. 1. Heart

The heart is a muscular organ that serves to collect deoxygenated blood from all parts of the body, carries it to the lungs to be oxygenated and release carbon dioxide. Then, it transports the oxygenated blood from the lungs and distributes it to all the body parts, the heart pumps around 7,200 liters of blood in a day throughout the body, the heart is situated at the center of the chest and points slightly towards the left, On average, the heart beats about 100,000 times a day, i.e., around 3 billion beats in a lifetime. ***(Yaniv Sherer et al., 2004).***

An adult heart beats about 60 to 80 times per minute, and newborn babies heart beats faster than an adult which is about 70 to 190 beats per minute. The heart has a somewhat conical form and is enclosed by the pericardium. It is positioned posteriorly to the body of the sternum with one-third situated on the right and two-thirds on the left of the midline. The heart measures 12 x 8.5 x 6 cm and weighs ~310 g (males) and ~255 g (females***). (Biglu, and Dadashpour. 2016).***

Cardiac rehabilitation is a complex, interprofessional intervention customized to individual patients with various cardiovascular diseases such as Coronary artery disease (CAD), Heart failure, Myocardial infarctions Patients who have undergone cardiovascular interventions such as coronary angioplasty or coronary artery bypass grafting. (**Shoenfeld et al., 2006).**