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Evaluation of lipid profile among Iraqi patients with the Breast Cancer

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Abstract: Breast cancer is most common cancer among women worldwide. In this study, the association between serum concentration of cholesterol, triglycerides(TG|), low density lipoproteins (LDL), high density lipoproteins (HDL),(VLDL) very low density lipoproteins and breast cancer has been investigated. These case control study include three groups: thirty women with breast cancer and fifteen healthy women as control group. Serum lipids: cholesterol,(LDL),(HDL) and (VLDL) were analyzed in all subjects of study using conventional method. The results of this study showed that there was a significant increase in the rate of the levels of total cholesterol (TC), triglycerides (TG), low density lipoproteins(LDL),(VLDL) very low density lipoproteins in the work group when compared with control (P=0.028, P=0.017, P=0.024 and P=0.033) respectively, except high density lipoproteins (HDL). We conclude that high concentration of cholesterol, triglyceride, (LDL), and (VLDL) may be associated with breast cancer.

Keywords: Lipid profile , Breast cancer , TG, HDL, VLDL .

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Introduction:

Breast cancer is a malignant tumor that starts in the cells of the breast most commonly from the inner lining of the milk ducts, or lobules that supply the ducts with milk (1). It is mainly the most frequent cancer detected in women and in the world it is the main reason for death from cancer in women (2). Most of the morbidity and death rates of patients with cancer are caused by metastasis of the cancerous cells to faraway organs. Metastasis occurs mainly in lung, bone, liver lymph nodes and in the brain. In spite of the continuous advance in methods of detection, surgery and chemotherapy, mortality rates from cancer of the breast still high (3).

The role of lipids in cancer in the maintenance of cell integrity is well documented (4). Any alteration in the plasma lipid profile in breast cancer cases can increase its risk status and its measurement may be helpful in evaluation of prognostic and diagnostic importance of the disease (5). Various studies have suggested that increased dietary fat or cholesterol are correlated with increased risk for occurrence of breast cancer (6,7).

Previous reports have also shown a positive correlation between low levels of total cholesterol (TC) or triglycerides (TG) and cancer morbidity (8,9).

Evaluation of alterations in lipids and lipoproteins may enlighten the role of these important molecules in the etiology of breast cancer. Furthermore,

monitoring the treatment of breast cancer patients is important as invasion and metastasis is common in these patients. Various reports have also shown an association of lipids and lipoproteins with the course of anticancer treatment (10,11).

Lipids are biomolecules serve many physiological functions in the body. They can be broadly divided into four groups based on their chemical structures, i.e. triacylglycerol, cholesterol, glycolipids and phospholipids (12,13).

Lipids function as a major form of stored nutrients (triacylglycerol), as precursors for adrenal and gonadal steroids and bile acids (cholesterol), and as extracellular and intracellular messengers (e.g; prostaglandins and phosphatidyl inositol) (14).

Lipids are carried in the body fluids as soluble protein complexes known as lipoprotein , Lipoproteins are classified by their density which, in turn, reflects size, into five main classes; chylomicrons, very low density lipoproteins (VLDL), intermediate density lipoproteins (IDL), low density lipoproteins (LDL) and high density lipoproteins (HDL) (12).

Lipid profile describes the different levels of lipids in the blood such as low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) and triglycerides (TG) (15). Increased levels of LDL cholesterol increases the risk of cardiovascular disease due to the high lipid content in blood. Elevated HDL cholesterol indicates a healthy cardiovascular system (16). Excess TG is independently associated with cardiovascular disease (17) and it is obtained from fats eaten in food or other energy sources. Very low-density lipoprotein is correlated to TG and independently associated with cardiovascular risk even with individuals who may have normal LDL cholesterol(18).

The gold standard for preventing cardiovascular risk is reduced total cholesterol levels(19) which can be achieved through continuous aerobic exercise (20).

The body fat increased with increase in serum triglyceride(21) and Low density lipoprotein constitutes the major transport form of cholesterol in the blood, which carry cholesterol from the liver to the various parts of body. An excess of cholesterol gets deposited in the arteries hence LDL-C is commonly known as bad cholesterol(22).

Dyslipidemia is a broad term that refers to a number of lipid disorders. Most (80%) of them are related to diet and lifestyle, although familial disorders (20%) are also important. The basic categories of dyslipidemias include: elevated low-density lipoprotein cholesterol (LDL-C), low high-density lipoprotein cholesterol (HDL-C), excess lipoprotein(a), hypertriglyceridemia, atherogenic dyslipidemia, and mixed lipid disorders. Most patients with cardiovascular diseases have mixed dyslipidemia (elevated LDL-C and low HDL-C) (23).

In a physician's healthy study, Triacylglycerol levels were found to be strongly correlated with the total cholesterol concentrations and inversely correlated with HDL-Cholesterol levels(24).

Methods:

The study was conducted in 2016 on Iraqi women. This study included two groups. The first group included 30 women with breast cancer their ages ranged from 20-60 with a mean ± SD of 47.86 ±9.76 years. Their age group distribution showed the highest frequency 12 patients (40%) were between 40-47 years. This was following by 10 patients (33.33%) in the age group (50-59) years and 4 (13.33%) patients in age of 60 years then 4(13.33) patients in age group of (20-37) years. While the second included 15 apparently healthy women. Their age ranged from (25-53) year with a mean± SD of 34.86±7.16 years. Their age matched those of patients group and radiotherapist group.

A venous blood samples were collected by taking (5ml) of blood from each patient, healthy human all of them are women. Serum was isolated by centrifugation at 3000 rpm for 10 min and the serum was divided into aliquots in eppendorf tubes until estimated of the lipid profile.

We analyzed the following variables: total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein (HDL-C) and triglyceride, by using biochemical methods and special kits from Biolabo company (France).

Statistical analyses was done using Microsoft SPSS version 24 which include the following (mean±SD), P-value of less than 0.05 was considered a significant.

Results and Discussion:

Lipid profiles:

Lipids are major cell membrane components essential for various biological function including cell growth and division of normal and malignant tissues (Patel *et al*., 2004).

In some malignant diseases, blood cholesterol undergoes early and significant changes. Several prospective and retrospective studies have been shown inverse association between blood lipid profile and different cancers(25).

Throughout this study total cholesterol, triacylglycerol, LDL-C, HDL-C and VLDL-C were measured in sera of healthy women (control group), patients with breast cancer to investigate the effect of breast cancer on plasma lipids and lipoproteins concentrations (Table-1).

Table (1): Lipid profiles of investigated groups.

Parameter / Groups	BMI (Kg/m^2)	Chol. mg/dl (mean±SD)	HDL (mean±SD)	LDL (mean±SD)	VLDL (mean±SD)	TG (mean±SD)
Control	28.14±3.27	A 181.53±21.07	A 49.52±8.14	A 112.53±12.55	A 36.34±4.02	A 181.36±21.14
Work group	31.32±4.06	B 223.31±38.92	A 51.18±6.59	B 125.62±13.63	B 46.83±4.17	B 232.64±43.65
LSD		8.15	2.31	4.27	4.07	8.06
P-value		0.028	0.52	0.024	0.033	0.017
Significant		P<0.05	Non.Sig.	P<0.05	P<0.05	P<0.05

*** Normal value : Cholesterol ≤200 , Triglyceride ≤150 , Hdl > 40 , Ldl ≤ 100**

Concentration of Cholesterol:

The results are presented in Table(1), and there is a significant increase in total cholesterol concentration in sera of work group in comparison with the control group (223.31±38.92 vs 181.53±21.07) (P<0.05).

Furthermore, lipids and lipoproteins have been associated with the risk of cancer (26).The result of the study had been revealed that there is increased level of total cholesterol in work group and this is due to the cholesterol which is the precursor to steroid hormone and endogenous steroid hormones are directly related to breast cancer(27).

These results were agree with the study of AL-Hamamy(2008)(28)who found that there is a rise in the level of cholesterol in women with breast cancer.

Similar study conducted by Al-Swelmien (2014)(29)who found that a significantly increased level of total cholesterol in patients with breast cancer which indicates that there is an association between total cholesterol and breast cancer.

A recent study showed that breast cancer has a close relationship with elevated cholesterol when compared with other type of cancers(30).

Concentration of Triacylglycerol:

Triglyceride concentration were also elevated in patients of breast cancer when compared with control (232.64±43.65 vs 181.36±21.14) (P<0.05) as shown in the table(1).

Our result are in agreement with other studies (28, 29, 31,32).

Previous studies have reported increased risk of breast cancer in association with elevated triglyceride (TG) levels (33). Association of increased TG concentrations with decreased levels of sex hormone binding globulin, resulting in elevated levels of free estradiol and subsequently increased risk of breast cancer, has been reported (34).

Concentration of High Density Lipoprotein-Cholesterol:

HDL-C was determined by using Biolabo biochemical kit. The results of HDL-C concentration in sera of control group and patients of breast cancer groups are presented in table (1). These results indicated that of non-significant difference in sera HDL-C concentration of working group in comparison with that of the control group(51.18±6.59 vs 49.52±8.14) (P=0.52). However a statically significant difference in HDL-C levels between cases and controls was reported by Ferraoni *et al* (1993)(35). Borrelli *et al*.,1993(36) who suggested that a high serum HDL-C could be a biochemical index of increasing risk of breast cancer. This result has been agreed with the study of Al-Swelmien (2014)(29).

The rise in the HDL-C level that shown in this study is very small and agreed with Ghahremanfard *et al* ;2015 (30) who found an association between high HDL levels and increased risk of breast cancer.

In another study, low HDL, as part of the metabolic syndrome, was associated with increased postmenopausal breast cancer risk (37).

Concentration of Low-Density Lipoprotein-Cholesterol:

The results of LDL-C which presented in table (1) revealed a

significant increase in concentration in sera LDL-C of work group in comparison with that of the control group.

The elevated LDL-C concentration is considered as risk factor for cancer as it has a significant role in the oxidation(7). Although no causative relation has been established between hyper or hypo-cholesterolemia and cancer development, possible mechanisms exist through which lipoproteins could contribute to cancer development. The LDL-C susceptible to oxidation, resulting in increased in lipid peroxidation during oxidative stress. Delimaris *et al* (2007)(38) reported that the increased concentration of reactive oxygen species and /or the inadequate clearance of free radicals by the cellular or circulating plasma antioxidant, leading to an increase of lipid peroxidation products of LDL-C, depending on the individual's oxidative status.

The results of this study were consistent with the Al-Swelmien(2014)(29) who found a significant difference between sera LDL-C .

Concentration of Very Low-Density Lipoprotein- Cholesterol:

The results of concentration of VLDL-C as shown in table (1). These results indicated a significant differences among control group and work group ($P<0.05$).

In This study the significant increase in VLDL-C levels agrees with the results reported by Shah *et al*(2008)(32) who found that plasma levels of VLDL was significantly higher in work group as compared with that of the control group and patients with benign breast tumors group. While Patel *et al*(2004)(39) reported a significantly decreased in VLDL-C levels in sera of patients with untreated head and neck cancer as compared to the control group. Also they reported that the changes in lipid profile have been associated with cancer because lipids play a key role in maintenance of cell integrity. A recent study showed that VLDL in vitro enhanced breast cancer cell viability, VLDL, increased the levels of mesenchymal markers Slug, Vimentin, and β-Catenin, and promoted breast cancer cell migration and invasion and VLDL enhanced secretion of angiogenic factors in breast cancer cells and promoted angiogenic activity (40).

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