

Evaluation of the blood lipid profile pattern in female breast cancer patients from Jordan

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ABSTRACT

Background: Breast cancer is a cancerous growth impacting approximately 2.26 million women globally, The World Health Organization reports that it is thought to be the tumor in women that is diagnosed the most commonly.

Objective: Examining any possible correlation between serum lipid concentrations and the cancer of the breast in a community sample of Jordanian women is the primary goal of the current investigation.

Methods: In this study 122 subjects were included, patient group consists of 94 women diagnosed breast cancer in oncology clinics in Jordan, where control group consists of 28 healthy women. Samples of Venous blood were collected from participant's subjects, after centrifugation obtained serum was used for assessment of Triglycerides, total cholesterol, and HDL-cholesterol levels using fully automated analyzer for biochemistry. The Fried Wald equation was applied for calculating serum concentrations of LDL-Cholesterol

Results: After comparison with control group, a strong positive significant notable elevation was observed in the BMI values of the breast cancer patients. (28.8 ± 3.9 vs. 25.2 ± 4.3 kg/m², $p > 0.005$). The patient group's serum levels of total cholesterol and triglycerides were observed to be considerably higher than those of the control group. (230.7 ± 86.9 vs. 177.6 ± 44.5 mg/dL, $p > 0.005$) and (209.4 ± 95.9 vs. 175.7 ± 45.6 mg/dL, $p > 0.005$) respectively. On other hand, the patients' group's blood LDL-cholesterol levels were found to be higher (122.8 ± 25.5 vs.

115.9 ± 26.9 mg/dL, $p > 0.005$). There was no notable alteration in Serum HDL-Cholesterol levels among the two group.

Conclusion: The current study's results indicate a clear correlation between increased body mass index (BMI), altered lipid profiles, and an increasing of risk of breast cancer in women living in Jordan.

KEYWORDS

Lipid profile, Females, Breast cancer, Total cholesterol, Jordan.

INTRODUCTION

Breast cancer is a disorder caused by uncontrolled developments of non-normal cells in the breast that grow into malignancies. This tumors have the potential to spread throughout the body and become deadly if treatment is not received. It is thought to be the primary reason of death for females in almost world countries. In females, it is the most commonly diagnosed tumor¹. Worldwide, in 2022, 2.3 million women received a breast cancer diagnosis, and 670,000 individuals lost their lives to the illness. After puberty, women can acquire breast cancer at any age, and the incidence increases with age in every country in the globe². According to the most recent GLOBOCAN figures, 2,403 instances of breast cancer were detected in Jordan in 2022, accounting for 28.6 % of all new diagnosed cancer cases among women. Jordan is a Middle Eastern nation home to 10,203,140 people. Breast cancer is the most frequent type of cancer in women and the main reason why Jordanian women die from cancer. After coronary heart diseases, cancer is Jordan's second greatest cause of death. After colorectal and lung cancers, Breast cancer is the third-leading cause of cancer-related deaths³.

Breast cancer is thought to have its origin from a complex interplay of both modifiable and non-modifiable variables.

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Genetics, environmental factors, dietary factors, hormonal factors, and heritable elements all contribute to the genesis of this disease⁴. Patients with breast cancer who have altered serum lipid levels will produce more tumor necrosis factor- α (TNF- α) and insulin will decrease the function of adipose lipoprotein lipase⁵. These alteration will cause impairment of very low-density lipoprotein cholesterol (VLDL-c) catabolism of, it is impacted by smoking, physical inactivity, weight, amount of fat in diet, consuming of alcohol consumed, and endogenous hormones⁶. In addition to that, Proliferating cells, like cancer cells, require more cholesterol and aid in the metabolism and synthesis of lipids, which ultimately raises serum cholesterol levels in patients group⁷. Both low-density lipoprotein cholesterol (LDL-c) and high-density lipoprotein cholesterol (HDL-c) transport and carry cholesterol. Therefore any increasing in serum level of LDL-c and HDL-c will be correlated with breast cancer and its normal serum concentration is regarded as predictive indicator for breast tumor⁶. Any rise in triglycerides (TG) and total cholesterol (TC) will cause fibrosarcoma and cell proliferation. It will also reduce the quantity of globulin that binds sex hormones, this will increase the likelihood of getting breast cancer. Consequently, a many of prior researches have examined the correlation between dyslipidemia and the onset of breast cancer in patients, yielding conflicting results⁸.

The current study's goal was to look at the anomalies in the lipid profile pattern in female breast cancer patients in Jordan.

METHODS

Ethical approval

All procedures in this study were performed in accordance with the principles of the Declaration of Helsinki. Ethical approval was granted by the Research Ethics Committee of the faculty of Allied Medical Sciences at Jadara University. The Approval reference number is: MLS -11/08/2019).

Study population, design and Period

In all, 122 Jordanian females were included in the current study between December 18, 2019, and September 25, 2021. The patient group is made up of females ($n = 94$, mean age 46.4 ± 12.8 years) who have received a histological diagnosis of breast cancer. These women were treated at oncology clinics located throughout Jordan's medical centers and specialty hospitals. Healthy Jordanian females ($n = 28$, mean age 46.7 ± 11.9 years) were chosen from staff relations to serve as the control group. Both subject groups willingly signed up for our study. After completing a seven-minute interview, each participant provided informed consent to take part in the ongoing research.

Exclusion criteria

Patient having a history of an elevation lipid profile levels, inflammatory disorders diabetes mellitus, renal problems, thy-

roid disorders, parenteral nutrition, Patients with anorexia or dieting were not accepted and were not recruited for this study. Pregnant patients also were excluded.

Anthropometric measurements

Once the height and weight of every participant were recorded, to the closest 0.5 cm and 0.5 g, respectively, the body mass index was determined. The following body mass index classifications were applied to the subjects in both groups: As previously documented, 18–25 kg/m² were normal participants, 25–30 kg/m² were overweight participants, and > 30 kg/m² were obese subjects⁹.

Procedure for Gathering Data and Laboratory Techniques

Using a test tube with a serum separator, a venous blood sample of five milliliters was taken. And the participant's identity was written on the tube. For separation of serum from whole blood, the collected blood was spun using a universal centrifuge set to 4000 revolutions per minute (rpm) for 10 minutes after being let to clot at room temperature for fifteen minutes on the test tube rack.

Using the Cobas 301 enzymatic colorimetric method, the amounts of serum TG, TC, and HDL-cholesterol were measured (Roche Diagnostics GmbH, Mannheim, Germany). The Fried Wald formula was utilized to ascertain the serum concentrations of low-density lipoprotein cholesterol (LDL-cholesterol).

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) was used to examine the data (SPSS) program (SPSS Inc. Headquarters, Chicago III USA). To ascertain the statistical significance of the variations among the groups of patients and controls, an independent Student t test was employed. Every outcome is shown as the average \pm standard deviation (SD). When $P < 0.05$, statistical significance was identified.

RESULTS

In the current investigation, we found that there was no variation in the average age among the control group and the patients group. However, compared to the controls group, the BMI of the patients group was noticeably elevated. (28.8 ± 3.9 vs. 25.2 ± 4.3 kg/m², $p = 0.002$) (Table 1).

According to the biochemical results, the patient group's serum TC levels were considerably higher than those of the healthy group (209.4 ± 95.9 vs. 175.7 ± 45.6 mg/dL, $p = 0.039$) (Table 1). Additionally, it was discovered that the patients' group's blood TG levels significantly increased in comparison to the healthy group (230.7 ± 86.9 vs. 177.6 ± 44.5 mg/dL, $p = 0.035$) (Table 2).

Table 1. The biometric features of the subjects

Characteristics	Healthy group (n = 28)	Patients group (n = 94)	p-value
Age (years)	46.4 ± 13.1	46.7 ± 11.9	0.280
BMI (Kg/m ²)	25.2 ± 4.3	28.8 ± 3.9	0.002

All data were examined using an independent student's t test. $P < 0.05$ was considered to indicate statistical significance. The results are shown as the mean ± SD. in contrast to the control cohort.

Table 2. Individuals' lipid biochemical parameters

Parameter	Control group (n = 28)	Patients group (n = 94)	p-value
TC (mg/dL)	175.7 ± 45.6	209.4 ± 95.9	0.039
TG (mg/dL)	177.6 ± 44.5	230.7 ± 86.9	0.035
LDL-C (mg/dL)	115.9 ± 26.9	122.8 ± 25.5	0.210
HDL-C (mg/dL)	44.8 ± 11.3	46.8 ± 11.7	0.340

In the breast cancer patient group, Blood levels of LDL- C were trending upward. (122.8 ± 25.5 vs. 115.9 ± 26.9 mg/dL, $p = 0.21$); however, this elevation was not statistically significant. Moreover, it was found that the reduced serum HDL-cholesterol levels in patients group and healthy people did not significantly differ (44.8 ± 11.9 vs. 46.8 ± 11.7 mg/dL) (Table 2).

DISCUSSION

Lately, numerous investigations have looked closely at the connection between lipid parameters concentrations and breast cancer. It is well acknowledged. that increased structural lipids are needed by tumor cells for lipid signaling, membrane production, and inflammatory activation. When compared to healthy mammary epithelial cells, cell lines from breast cancer showed abnormal lipid metabolism in preclinical research¹⁰. In this study, the total of the 122 women comprising of 28 controls and 94 patients with breast cancer, were voluntary participated. In this study the main goal is to investigate any possible link between blood lipid profile concentrations and breast cancer patients in Jordan. and also for assessment of any correlation between BMI and breast cancer. In our study, the mean age of patients with confirmed breast cancer was 46.7 ± 11.9 years, whereas the mean age of the healthy group was 46.4 ± 13.1 years. (Table 1). The age between 35 to 50 years old was found to include the bulk of breast cancer subjects (78%).

GLOBOCAN reports that the rate of breast cancer cases in females is surpassed all other cancer kinds in 2020 and was

the highest globally, with 2.3 million additional cases predicted yearly¹¹. this type of cancer is causing a cancer-related mortality among women. Therefore, ongoing research is being done to find practical and reliable illness outcome predictors that can inform prompt therapies aimed at enhancing patient survival.

Worldwide, the most prominent kind of cancer is breast cancer¹², early detection is crucial in order to decrease its effects on morbidity and death, Numerous variables, involving early menarche, obesity, a sedentary lifestyle, and a late menopause, oncogenic factors related to hormones, genetics, the environment, and an older age during the first pregnancy, seem to raise the prevalence of this disease¹³. The greatest proven risk factor for breast cancer is obesity. However, there is still some disagreement over the connection between patterns of lipid profiles and breast cancer¹⁴.

The current investigation revealed that, when compared to the healthy group, Jordanian breast cancer patients had higher BMI and serum concentration of TC and TG. The likelihood that a woman will get breast cancer has been proven to be accurately predicted by adult weight gain or an increase in BMI, a measure of obesity¹⁵. It was reported that overweight and obesity are alarmingly prevalent among Jordanians in general¹⁶, and among Jordanian women specifically¹⁷. Based on the findings in our study BMIs of Jordanian breast cancer females were elevated in those of healthy females., suggesting a link between obesity and a higher chance of getting breast cancer. These outcomes were revealed by Engin et al. in a prior study¹⁵. Owing to the substantial amount of adipocytes found in breast tissue, obesity associated with external lipid supply could be an important component in the growing of malignancies^{17,18}. This will lead to activation of lipid degradation within adipocytes which will produce different molecules, like fatty acids, which are absorbed by cells that are infected, encouraging tumorigenesis in breast tissues¹⁹. However, obesity also causes breast adipose tissue macrophages to release proinflammatory cytokines including interleukin-6 (IL-6), which cancer cells taken up and cause an increase in the migration and proliferation of tumor cells²⁰. It is imperative to conduct more research on the role that inflammation generated by obesity plays in the pathogenesis and progression of breast tumors. Nonetheless, there is no documented a link between BMI and breast cancer patients²¹.

A relationship exists between TC and the chance of growing of malignant cells. As evidenced by the current study's observation of a substantial increase in TC levels in patient group opposed to the normal group. This outcome was consistent with other earlier investigations²². Additionally, in comparison to the healthy group, the patients had a moderate elevation in their blood cholesterol level (21%)²³. Additionally, Bani et al. discovered that breast cancer patients had an elevated blood TC concentration²⁴. This time, Laamiri FZ et al.

suggested that Tumor cells' lipid metabolism is not the same as that of normal cells²⁵, and that elevated serum TC levels may be a major factor in carcinogenesis²⁶. Elevated cholesterol levels that are promoting the development of mammary tissue carcinogenesis may be an attempt to provide the high demand for the formation of plasma membranes and other chemicals containing cholesterol in newly formed cells derived from rapidly proliferating breast cancer cells²⁷. However, published data is contradictory, and the link between serum TC levels and breast cancer danger appears to be contentious.

In this research we found that there is a 26% of total patients have a high serum TG concentrations, which is parallel with earlier study of 31%²⁷. In Our study's we found that is an increasing in serum TG levels this result is likewise in line with the meta-analysis research by Ni et al.²⁸. These findings are inconsistent with another study that did not find any appreciable variation in serum TG concentration among study groups²⁹. Breast cancer patients' elevated blood TG levels in our study can be attributed to the cancer cells' activation of adipocytes to lipolyze their stored triglyceride¹⁸.

The serum LDL-C levels in patients and healthy groups were not differ in our research, this outcome agrees with that of another article²⁹. On the other hand, LDL-cholesterol levels were reported to have significantly decreased by Shah et al³⁰.

Unlike Yangoua et al.²⁷, in present investigation no statistically significant difference was seen. in blood HDL cholesterol levels among the two research groups in the Jordanian population The HDL- cholesterol concentration of breast cancer patients and controls differed statistically significantly.

Strengths and limitations

Both positives and weaknesses can be found in our investigation. However, this study is the first to look at changes in the lipid profile in Jordanian patients with breast cancer in recent years. However, the present study did not take into account the stage of breast cancer in Jordanian females, which could have led to a significant variance in the lipid profile characteristics within the patient group.

This study highlights the significance of routinely measuring lipid levels in breast cancer patients and then periodically monitoring their lipid profile as part of their therapy.

CONCLUSION

According to this study findings, Jordanian women with breast cancer had aberrant serum lipid profiles. Consequently, lowering blood cholesterol levels and keeping a normal BMI are crucial to lowering the prevalence of breast cancer among female Jordanians.

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