The Serum Lipids in Breast Tumors (Benign, Malignant)

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Abstract. BC (Breast Cancer) is the most common cancer worldwide. Lipids are known to play an important role in many biochemical processes at the molecular and cellular level. In the present study, we investigated the lipid level change in women with breast cancer. A hospital-based randomized case-control study was carried out in 40 patients (15 with benign tumors; 10 with malignant tumors, and 15 healthy patients of same age group and demographics). The lipid spectrum: total cholesterol (TC), high-density lipoproteins (HDL), low-density lipoproteins (LDL), very-low-density lipoproteins (VLDL) and triglycerides (TG) were investigated. $P<0.05$ was considered statistically significant. The study revealed a high level of TC, LDL, and TG against the background of decreased HDL and VLDL in women with breast cancer. On the basis of the study, it can be concluded that lipids can be used as an additional and reliable biomarker for breast tumors diagnosis and treatment.

Key Words: serum lipids, breast tumors

Introduction. BC is widespread worldwide, with an incidence of over one million new diagnoses yearly [1]. In recent times, mortality has decreased, but BC is still one of the most major causes of death among young women. The tumor cell lipid metabolism plays a crucial role in cancer development [2]. Several lipogenic regulatory pathways are dysregulated in tumors [3-5]. It is well known that most of the tumor cells show hyperactivation of various lipid synthesis pathways as they have increased requirements for CHOL, including BC. CHOL is the precursor to several biochemical pathways, among them is the synthesis of steroid hormones, which are involved and main regulator in the etiology and development of BC. In the present study, we aimed to investigate the association between serum lipid levels and breast tumors.

Materials and Method. The women in our study participated as three populations during 2017-2018: two groups of patients with breast tumors aged between 30 and 45 years (benign - 15 and malignant - 10 patients). Also, the control group of women was age-matched (in the control group - 15 patients). The following clinicopathological characteristics serum total cholesterol CHOL (CHOL), High-Density Lipoproteins (HDL), Low-Density Lipoproteins (LDL), Very-Low-density Lipoproteins (VLDL), and Triglycerides (TG) were analyzed in/with each group (control group. Benign tumor, malignant tumor). The analysis was performed by biochemical analyzer - Roche Cobas c 311. All data were analyzed using GraphPad Prism 6 versions. A value of $P < 0.05$ was considered significant statistically.

Results. The level of T-CHOL is high compared to the control group. CHOL level is higher about 1.19-fold in the benign tumor (P=0.00013), and 1.37-fold in the malignant tumor (P=0.0022) compare to the control group (Fig. 1.a). The level of HDL is decreased 1.2-times in benign tumors (P=0.003) and 1.33-fold in malignant breast tumor (P<0.0001) compare to

control group (Fig. 1.b). LDL level is high about 1.2-fold in benign tumor (P=0.0021) and 1.3-fold (P<0.0023) in breast malignant tumor group (Fig. 1.c). VLDL level is decreased about 1.6-fold in benign breast tumor (P=0.0001), and 1.7-fold in breast malignant tumor (P=0.0004) compare to control group (Fig. 1.d). TG level is increased about 1.09-fold in benign breast tumor (P=0.0016) and 1.1-fold among the breast malignant tumor (P=0.003) compare to control group (Fig. 1.e).
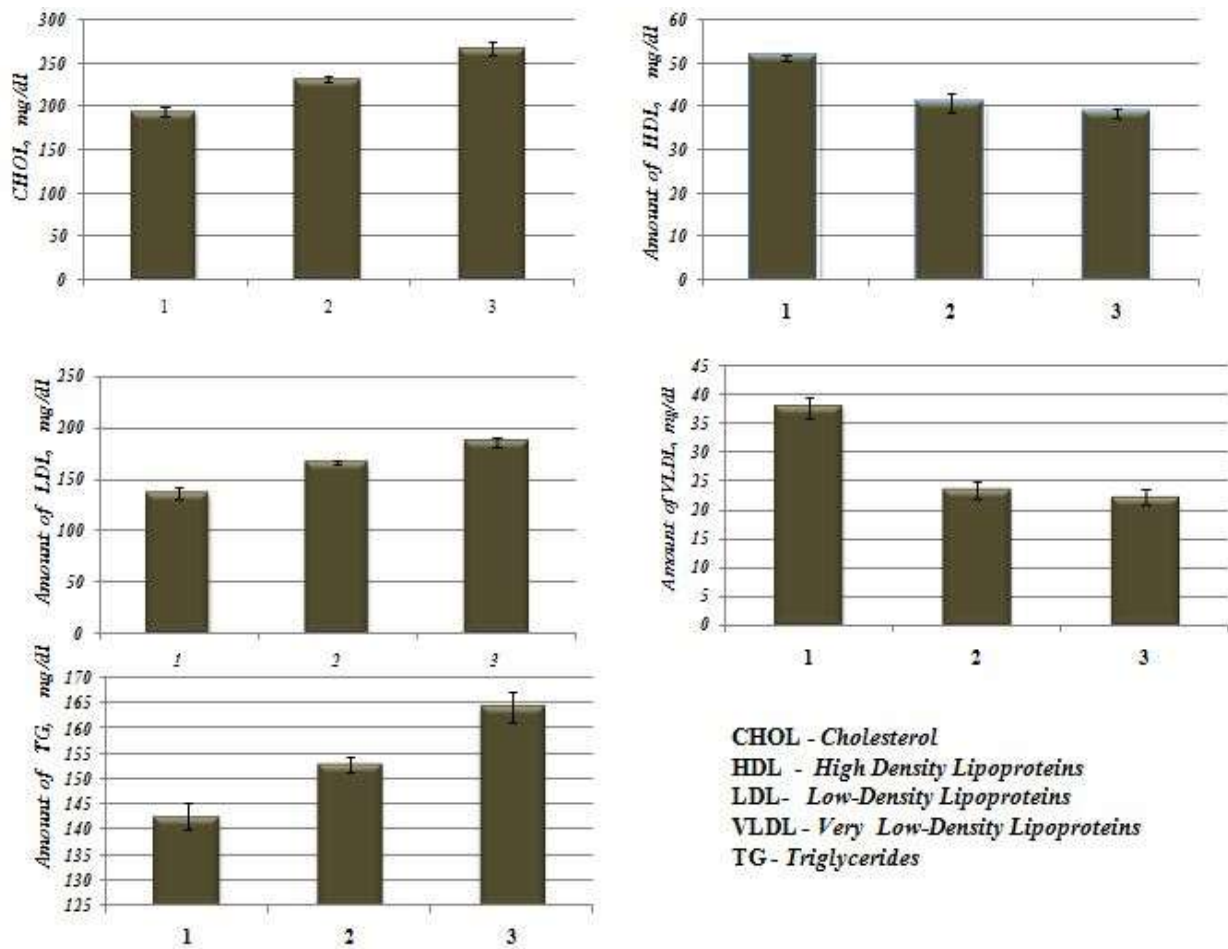

CHOL - Cholesterol
HDL - High Density Lipoproteins
LDL- Low-Density Lipoproteins
VLDL - Very Low-Density Lipoproteins
TG - Triglycerides

Fig. 1. The Lipids levels among women with breast tumors (Benign, malignant)

Discussion. It is known that any alterations in lipid metabolism are related to critical cellular processes, including cell growth, proliferation, differentiation, and also motility [2]. However, It is well-known cholesterol and lipoproteins involve in the proinflammatory signaling pathways. Accordingly, are key molecules for tumor development. It has suggested that both benign and malignant proliferation of breast tissue were connected changes in plasma lipid and lipoprotein levels [3-6]. Notably, that lipid metabolism belongs to the complex physiological process, are contributed lipid intake, synthesis and transportation, and other function including regulation of another gene expression as well [4]. The studies

enhanced the opinion that alteration in lipid levels directly is connected with initiation the carcinogenesis processes and cancer transformation. Accordingly cause the accelerated of cancer cell proliferation is in high demand for energy, which induces changes in lipid metabolism [7]. Based on the clinic pathological study of BC, it is suggested that plasma levels of TC, TG, HDL, and LDL of BC patients have significantly higher compared to control group. Also, it should be noted that in TC and TG levels of patients with metastasis were significantly higher in comparison to patients without lymphatic metastasis [8]. According to studies, TC level was positively associated with BC [9]. As our research revealed that, increase of LDL, CHOL, and TG levels and decreased HDL and VLDL are significantly associated with BC.

Conclusion. Lipids profiles may be useful for diagnostics therapeutic target for BC treatment in the future.

References:

1. Wcrf.org. (2018). Breast cancer statistics Word Cancer Research Fund International. https://www.wcrf.org/dietandcancer/cancer-trends/breast-cancer-statistics.

2. Santos, CR., Schulze, A. (2012). Review Lipid metabolism in cancer. *FEBS J,* 279(15):2610-23.

3. Gallagher, E., Zelenko, Z., Neel, B., Antiniou, I., Kase, N. and Leroith, D. (2017). Elevated tumor LDLR expression accelerates LDL cholesterol-mediated breast cancer growth in mouse models of hyperlipidemia. *Oncogene,* 36(46), pp. 6462-6471.

4. Li, X., Liu, ZL., Wu, YT., Wu, H., Dai, W., Arshad, B., Xu, Z., Li, H., Wu, KN., Kong, LQ. (2018). Status of lipid and lipoprotein in female breast cancer patients at initial diagnosis and during chemotherapy. *Lipids Health Dis*, 20;17(1):91. DOI: 10.1186/s12944-018-0745-1. PubMed PMID: 29678178; PubMed Central PMCID: PMC5910614.

5. Blucher, C. and Stadler, S. (2018). Obesity and BC: Current Insights on the Tole of Fatty Acids and Lipid Metabolism in Promoting BG Growth and Progression. *Frontiers in Endocrinology,* DOI: 10.3389/fendo.00293.

6. Bauman, J., Sevinsky, C. and Conklin, D. (2013). Lipid biology of breast cancer. *Biochimica Biophysica Acta,* 1831(10), pp. 1509-1517.

7. Zhu, Y., Aupperlee, MD., Zhao, Y., Tan, YS., Kirk, EL., Sun, X., Troester, MA., Schwartz, RC., Haslam, SZ. (2016). Pubertal and adult windows of susceptibility to a high animal fat diet in Tpr53-null mammary tumorigenesis. *Oncotarget,* 7(50):83409-83423.

8. Wei, LJ., Zhang, C., Zhang, H., Wei, X., Li, SX., Liu, JT., Ren, XB. (2016). A case-control study on the association between serum lipid level and risk of breast cancer. Zhonghua Yu Fang Yi Xue Za Zhi. 50(12):1091-1095.

9. Kitahara, CM., Berrington, DE., González, A., Freedman, ND., Huxley, R., Mok, Y., Jee, SH., Samet, JM. (2011). Total cholesterol and cancer risk ana large prospective study in Korea. *J Clin Oncol,* 20; 29(12):159208.

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რეზიუმე. სარძევე ჯირკვლის სიმსივნე მსოფლიოში ფართოდ გავრცელებული სიმსივნეა. ცნობილია, რომ ლიპიდები ასრულებენ მნიშვნელოვან როლს მრავალ ბიოქიმიურ პროცესში მოლეკულურ და უჯრედულ დონეზე. წარმოდგენილ ნაშრომში ჩვენს მიერ შესწავლილია ლიპიდების დონის ცვლილება სარძევე ჯირკვლის სიმსივნით დაავადებულ ქალებში. რანდომიზებული კვლევა ჩატარდა ჰისტოლოგიურად დიაგნოსტირებული სარძევე ჯირკვლის სიმსივნით დაავადებულ 40 პაციენტში (15 კეთილთვისებიანი სიმსივნე; 10 ავთვისებიანი სიმსივნე და 15 ჯანმრთელი პაციენტი იმავე ასაკობრივი ჯგუფიდან მსგავსი დემოგრაფიული მონაცემებით). გამოკვლეულეთა იქნა ლიპიდური სპექტრი: საერთო ქოლესტერინი (CHOL), მაღალი სიმკვრივის ლიპოპროტეინები (HDL), დაბალი სიმკვრივის ლიპოპროტეინები (LDL), ძალიან დაბალი სიმკვრივის ლიპოპროტეინები (VLDL) და ტრიგლიცერიდები (TG). P<0.05 განიხილებოდა სტატისტიკურად მნიშვნელოვნად. კვლევამ გამოავლინა CHOL, LDL და TG მაღალი დონე შემცირებული HDL და VLDL ფონზე სარძევე ჯირკვლის სიმსივნეებით დაავადებულ ქალებში. ამრიგად, ჩვენი კვლევის მიხედვით, ლიპიდები შეიძლება გამოყენებულ იქნეს, როგორც დამატებითი და საიმედო ბიომარკერი სარძევე ჯირკვლის სიმსივნეების დიაგნოსტირებასა და მკურნალობისთვის.

საკვანძო სიტყვები: ლიპიდები, სარძევე ჯირკვლის სიმსივნეები