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Original Research Article

ASSOCIATION OF SERUM LIPID PROFILE WITH BREAST CANCER: A COMPARATIVE STUDY

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ABSTRACT

Background: Breast cancer is the most common malignancy among women worldwide, with an increasing incidence linked to lifestyle and metabolic factors. This study aims to evaluate the association between lipid profile parameters and breast cancer in a South Indian population.

Materials and Methods: A case-control study was conducted at the Department of General Surgery, Mysore Medical College and Research Institute. Two hundred twenty-six histologically confirmed breast cancer patients and 166 age-matched healthy controls were included. Serum lipid profiles, including total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C), were measured after overnight fasting using standard biochemical methods.

Results: Breast cancer patients exhibited significantly higher mean TC (209.43 vs. 196.93 mg/dL, p=0.008) and LDL-C levels (123.41 vs. 108.50 mg/dL, p=0.032) compared to controls. No significant difference between the groups was observed in HDL-C levels (p=0.876).

Conclusion: This study highlights a significant association between elevated TC and LDL-C levels and breast cancer, suggesting that dyslipidemia may play a role in its pathogenesis.

Keywords: Breast cancer, serum lipids, total cholesterol, LDL-C, HDL-C, triglycerides.

INTRODUCTION

Breast cancer is a major global health problem and is the most frequently diagnosed cancer in women worldwide.[1-3]The incidence of this disease is increasing possibly linked to increased urbanisation and lifestyle changes.[4,5] Serum lipids, such as total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL) cholesterol and low-density lipoprotein (LDL) cholesterol, have received a great deal of attention for their important roles in cellular function hormone synthesis and general health.[1,2] Changes in serum lipid profiles are involved in the development and progression of several malignancies, including breast cancer. A key area of research is, therefore, the understanding of the specific relationship between lipid metabolism and the risk and prognosis of breast cancer.

Numerous studies have investigated the association between serum lipid levels and breast cancer, but the findings are still largely inconclusive and sometimes contradictory.[1-3,6,7]Some studies suggest that increased levels of specific lipids, such as total cholesterol and LDL-C, may be associated with an increased risk of breast cancer or with a poorer outcome.[3,8] On the other hand, other studies do not show any significant association or even inverse correlation, especially not for triglycerides.[7,8] The role of HDL-C, often considered a protective lipid, has also been shown to produce contradictory results. Some studies indicate an inverse relationship between breast cancer risk, and other studies indicate no association or even a positive correlation in specific populations.[1,2,7] These discrepancies may be due to differences in the design of the studies, population characteristics, menopausal

status, stage of the cancer, and other confounders. Therefore, the exact effect of dyslipidaemia on the onset and progression of breast cancer is not fully understood. This study compared serum lipid levels in patients with breast cancer and healthy controls.

MATERIALS AND METHODS

This study was conducted in the Department of General Surgery, Mysore Medical College and Research Institute. The study group consists of 226 histologically proven female breast cancer patients and 166 healthy controls. Two hundred twenty-six consecutive breast cancer patients who were treated in the General surgery department from October 2016 to December 2018 were selected as Cases. Those who were on lipid-lowering therapy were excluded from the study population. Patient data, including age, menopausal status, tumour grade, side affected, height and weight, were collected. The Institutional Research Committee approved the study.

Blood samples were collected by venipuncture after overnight fasting (> 8 hours). The serum lipid profile (Total cholesterol-CHOD-POD method; triglycerides-GPO-POD method, HDL-Cholesterol (HDL-C)—indirect method by selective precipitation of low-density lipoprotein cholesterol by phosphotungstate and MgCl2) was estimated using EM 360 Autoanalyser (Transasia) utilizing kits provided by Agappe diagnostics. LDL cholesterol (LDL-C) was calculated using the Friedewald formula.

Statistical analysis was performed using SPSS version 16. Data were analyzed using a student t-test. A p-value less than 0.05 is considered statistically significant.

RESULTS

The study included 226 patients with breast cancer and 176 age-matched healthy individuals as the control group.The age distribution was similar in both groups, with a mean age of 49.15 years in cases and 48.35 years in controls (Figure 1). The median age of the breast cancer patients in the study population was 48 years (Standard deviation—10.04). The minimum age was 27, and the maximum was 82. The general characteristics of the study population are shown in Table 1.

Fifty-six per cent of the patients were postmenopausal. Fifty-nine per cent of the breast cancer patients had right-sided disease, and fifty-five per cent of the breast cancer patients had grade 2 disease. The majority of the patients were non-vegetarian (92.9%). Most patients had menarche at 16 or younger (91.6%). Most patients' mean age at first birth was 22 years or older (77.4%). Most patients were married (98.7%) and had at least a high school education (98.7%).

Table 2 shows the comparison of lipid parameters between the two groups. The mean total cholesterol level was significantly higher in the patient group (209.43 vs. 196.93 mg/dL, p=0.008). The mean LDL level was also significantly higher in the patient group (123.41 vs 108.50 mg/dL, p=0.032). The mean HDL level was slightly higher in the patient group, but the difference was not statistically significant (62.25 vs. 62.23 mg/dL, p=0.876). The mean triglyceride level was significantly higher in the control group (178.41 vs. 156.56 mg/dL, p=0.048).

Table 1: General characteristics of study population

	Cases(N-226)	Controls(N-176)
Age group		
≤ 30	4	0
31-40	40	16
41-50	94	48
51-60	56	84
61-70	24	28
≥ 70	8	0
Menopausal Status		
Premenopausal	98	60
Post-menopausal	128	116
BMI	23.90±1.32	22.02±1.55
Side of breast affected		
Right	134	
Left	92	
Grade of the tumor		
I	28	
II	126	
III	72	
Diet History		
Non Vegetarian	212	168
Vegetarian	14	8
Age at menarche		
< 16 years	207	171
≥16 years	19	5
Age at parity		

<22 years	43	23
≥22 years	175	148
Nulliparous	8	5
Using oral contraceptive		
Yes	22	18
No	204	158
Educational status		
No education	12	11
Elementary school	84	60
High school	105	83
College/university	25	22
Marital status		
Yes	223	174
No	3	2

Table 2: Comparison of Lipid parameters among cases and controls

	Cases (Mean ± SD)	Controls (Mean ± SD)	p-value
Total Cholesterol	209.43±38.11	196.93±49.8	0.008
HDL-C	62.25±12.43	62.23±19.45	0.876
LDL-C	123.41±44.46	108.50±39.11	0.032
TG	156.56±57.0	178.41±57.7	0.048

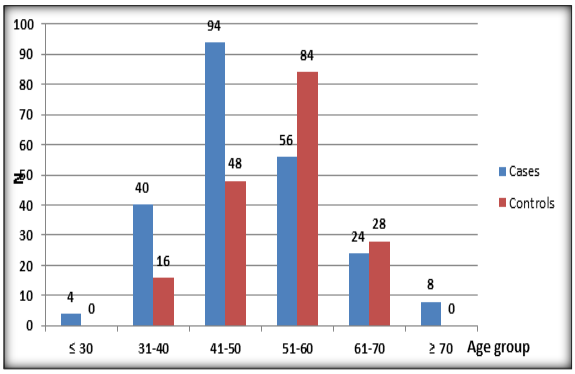

Figure 1: Age distribution of Patients and Controls

DISCUSSIONS

Breast cancer is now considered to be the most common cancer in women in India.[3,4,9,10] It is believed that changes in lifestyle and diet are linked to an increase in breast cancer incidence in developing countries. Local eating patterns, with increased consumption of animal fats, alcohol and a sedentary lifestyle, have been associated with several cancers, including breast cancer.[1,2,9]Several tumour types have reported an association between serum lipids and lipid fractions.[10,11]

In this study, total cholesterol, LDL-C and TG were found to be significantly associated with breast cancer compared with the control age group. These findings are consistent with several other studies which have shown increased total cholesterol and LDL-C levels in patients with breast cancer compared with healthy controls.[12-15] For example, one study in India also found that breast cancer patients had significantly higher total cholesterol and LDL levels. Another study reported an increase in LDL-C levels in patients with breast cancer.[16]Some studies, however, contradict this finding. One meta-analysis of cohort studies did not find a significant association between total cholesterol and the development of breast cancer, although a positive correlation was observed after adjustment for hormone use and physical activity.[7] Another study even reported lower T-CHOL levels in a cancer group in a specific age group. In addition, a large meta-analysis has shown that LDL-C is not associated with the development of breast cancer.[16] Our results are in contradiction with a few studies that have shown no statistical association between total cholesterol and breast cancer.[15,16]

No association between HDL-C and breast cancer has been observed. A meta-analysis concluded a negative and significant association between HDL-C level and the risk of breast cancer.[1] Some studies have even shown that low serum levels of HDL-C are associated with an increased risk of breast cancer and poorer prognosis in certain subtypes like triple-negative breast cancer.[17]

Lipid profiles observed in patients with breast cancer may be attributed to a number of pathological mechanisms. Cancer cells show increased lipid biosynthesis and uptake to promote rapid proliferation, which may affect serum lipid levels.[2,16] Hormonal changes associated with breast cancer, especially in hormone-dependent cases, may also affect lipid metabolism, with changes being observed with menopause.[1,16] In addition, systemic inflammation due to tumours affects lipoprotein production and clearance, contributing to dyslipidaemia.[11] The tumour microenvironment modulates lipid metabolism by altering hepatic and adipose tissue lipid processing. In addition, oxidative stress-induced dysfunction of high-density lipoprotein (HDL) may compromise its protective antioxidant and anti-inflammatory functions and exacerbate lipid abnormalities in patients with breast cancer.[1,17]

CONCLUSION

The results of this study indicate a strong association between changes in lipid profiles and breast cancer, especially with increases in total cholesterol and LDL-C. These results are consistent

with several previous studies and support the hypothesis that dyslipidaemia may be involved in the development and progression of breast cancer. However, the lack of a significant relationship to HDL-C and the conflicting findings in the existing literature suggests that further research is needed to clarify these relationships. Future studies with larger cohorts and standardised methods are needed to understand better the impact of lipid metabolism on the risk and prognosis of breast cancer.

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