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Original Article

Surgery Section

A Comparitive Study to Evaluate the Role of Serum Lipid Levels in Aetiology of Carcinoma Breast

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ABSTRACT

Introduction: Breast cancer is the most common occurring cancer in women worldwide. Various factors that have lead to change in lifestyle are thought to be associated with increase in breast cancer incidence in Asian countries. Several clinical studies suggest the prognostic significance of serum lipid levels in breast cancer. Present study was planned to confirm the association of lipids levels with breast cancer.

Materials and Methods: Lipid analyses was carried out on serum samples from 100 breast cancer patients and 100 control women, with a age group of 25 y and above. The case & control group included 50 premenopausal women and 50 postmenopausal women.

Results: Patients of study group had high Low density lipoproteins (LDL) (p-value - 0.00), Triglycerides (TG) (p-value -0.001) and Total cholesterol (TC) (p-value -0.00) as compared to control group. There was no association of VLDL (p-value -0.436) and HDL (p-value -0.797) among study group and control group. There was no association of lipid levels in different grades of carcinoma.

Conclusion: High levels of LDL, TG and TC were associated with breast cancer. However, no association was there in different grades of carcinoma. So it may be concluded that, LDL, TG and TC may be having some role in aetiology of breast cancer. Therefore, early detection and control of these factors may help in reducing the incidence of breast cancer and ultimately social and economic burden on society.

Keywords: Breast cancer, Lipid level, Post menopausal, Premenopausal

INTRODUCTION

Breast cancer is the most common occurring cancer in women worldwide. In 2012, there are estimated 14.1 million new cases of breast cancer in world [1]. Highest rates are reported in Europe and North America. Although there are higher incidence in western countries but there is now changes in the trends of breast cancer among Asian countries [2].

Various factors that have lead to change in lifestyle are thought to be associated with increase in breast cancer incidence in Asian countries. Factors include higher consumption of animal fat, obesity, less physical activity, early menarche, and increased age at the first pregnancy [3,4].

Obesity has complicated relationship to breast cancer risk. Studies have shown that obese women are more likely to have large tumors, greater lymph node involvement, and poorer breast cancer prognosis with 30% higher risk of mortality [5]. Levels of circulating lipids and lipoproteins have also been associated with high breast cancer risk, though published results have been varying [6-8].

Possible mechanisms explaining the role of adipose tissue in the aetiology of breast cancer involve an increase in estrogen synthesis [9], increase in insulin levels, and a decrease in adiponectin levels.

The relation between serum lipids levels and breast cancer risk is unclear; because cholesterol is the precursor to sex steroid hormones, higher levels of cholesterol could possibly increase risk of breast cancer. Present study was planned to evaluate the relationship between serum lipids and breast cancer by menopausal status, body mass index (BMI), type & stage of cancer.

MATERIALS AND METHODS

After Instutional Ethical Committee clearance and written informed consent, the present study was carried out on serum samples from 100 breast cancer patients named study group and normal women named control group, with an age group of ≥25 y. Both the groups were further subdivided into equal number of premenopausal and post menopausal patients. The control group consists of healthy females who were not taking any hormone prepration. The study group and control group patients were labeled as postmenopausal if there is no history of mensuration in the last three years, or, there is history of hysterectomy without oophorectomy before menopause and were 48 y of age or older.

Patients with age <25 y, having history of diabetes, hypertension, coronary artery disease, metabolic syndrome, endocrine disorders, renal and hepatic failure or taking oral contraceptive or any form of hormonal medication, having family history of breast cancer or suffering from any other malignancy/benign breast disorders were excluded from the study.

All patients in study group and control group were evaluated by detailed history, complete general physical and local clinical examination, details of age, height, weight, BMI, age at menarche and age at menopause. The diagnosis of carcinoma breast was made by fine needle aspiration cytology and confirmed by histopathological examination. Lipid pattern studies were carried out on study group and control group before any treatment. Whole blood sample of 5ml was taken from each participant of study group and control group. After clotting, sample was centrifuged for serum separation. All patients of study group and control group were fasting at least 8 h before collection of sample.

The serum samples so collected were examined for Total cholesterol (TC), High density lipoprotein cholesterol (HDL), Low density lipoprotein cholesterol (LDL), Very Low density lipoprotein cholesterol (VLDL) and Triglyceride (TG) concentrations. Serum Triglycerides were measured by Glycerol phosphate oxidase peroxidase method. HDL is separated from VLDL and LDL fractions using phosphotungstic acid and magnesium chloride. Cholesterol, separated from HDL fraction with centrifugation, was assayed with Cholesterol oxidase peroxidase method. Serum LDL was measured by Friedwald's equation and serum VLDL was calculated using

formula - Triglycerides/5. The results so obtained were analysed and conclusions drawn.

STATISTICAL ANALYSIS

All data was analyzed using the Statistical Package for Social Sciences (SPSS) software computer program version. Data were expressed as mean ( ) and standard deviation (SD) following analyzes using student t-test, which was performed for comparison between control and patient groups. A value of $p < 0.05$ was considered significant, and $p < 0.01$ was considered as statistically highly significant.

RESULTS

In this study lipid analysis was carried out on serum samples from 100 breast cancer patients and 100 control women, with an age group of 25 y and above. Distribution of patients in groups, BMI and their age at menarche and menopause is shown in [Table/Fig-1].

In this study maximum numbers of patients were in the age group 41-50 y (35). Minimum numbers of cases were in the age group of less than 40 y (15) followed by 28 patients 51-60 y and 22 patients with more than 60 y of age. The youngest patient was of 30 years and oldest patient was of 80 y. Mean age of the study group was 53.27 y. In the control group, maximum numbers of patients were in the age group of less than 40 y (45). Minimum numbers of patients were in the age group of 51-60 y (16) followed by 18 patients in those with 60 y age or above and 21 patients in 41-50 y. The youngest patient was of 25 y and oldest patient was of 80 y. Mean age of the control group was 44.55 y. The number of menstrual years was found higher in breast cancer patients as compared to controls with early menarche and late menopause [Table/Fig-1].

	Study group	Control group	p-value
Total no. of patients (premenopausal+ postmenopausal)	100 (50 + 50)	100 (50 + 50)	
BMI (Body mass Index) (mean ± SD)	23.316 ± 1.5466	22.9 ± 1.6435	0.067
Age at menarche (years) (mean ± SD)	12.42 ± 0.6	14.54 ± 0.9	0.0
Age at menopause (years) (mean ± SD)	47.62 ± 0.4	45.16 ± 0.6	0.0

[Table/Fig-1]: Showing distribution of groups, BMI, age at menarche and menopause
p-value < 0.05 – significant (S), > 0.05 – Non significant (NS)

Lipids Levels (mg/dl)		Study group (mean ± SD)	Control group (mean ± SD)	p-value
LDL	Over all	106.61 ± 26.634	83.87 ± 29. 027	0.00
	Premenopausal	105.22 ± 23.406	82.72 ± 29. 552	0.00
	Postmenopausal	108 ± 29.690	85.02 ± 28.746	0.00
VLDL	Over all	30.27 ± 13.244	28.92 ± 11.103	0.436
	Premenopausal	31.90 ± 14.056	27.22 ± 10.197	0.06
	Postmenopausal	28.64 ± 12.305	30.62 ± 11.797	0.413
HDL	Over all	39.36 ± 5.522	39.14 ± 6.524	0.797
	Premenopausal	40.20 ± 5.115	38.06 ± 6.264	0.064
	Postmenopausal	38.52 ± 5.832	40.22 ± 6.662	0.178
Triglycerides	Over all	130.91 ± 39.307	112.08 ± 40.848	0.001
	Premenopausal	120.94 ± 26.338	105.60 ± 37.460	0.02
	Postmenopausal	140.88 ± 47.144	118.56 ± 43.385	0.016
Total cholesterol	Over all	177.54 ± 43. 236	144.27 ± 31.505	0.00
	Premenopausal	183.76 ± 40.485	142.04 ± 29.965	0.00
	Postmenopausal	171.32 ± 45.376	146.50 ± 33.126	0.002

[Table/Fig-2]: Lipid profile of premenopausal and post menopausal women with breast cancer
p-value < 0.05 – significant (S), > 0.05 – Non significant (NS)

Lipid levels (LDL, VLDL, HDL, TC, TG) as measured in both groups in premenopausal and post menopausal women are shown in [Table/Fig-2]. Levels of LDL, TC and TG are significantly more in both premenopausal and post menopausal age groups in women having breast cancer than their corresponding groups in control group. In this study 44 patients belonged to well differentiated carcinoma (27 premenopausal patients and 17 Postmenopausal patients), 52 patients had moderately differentiated carcinoma (19 premenopausal patients and 33 Postmenopausal patients) and 4 premenopausal patients were of poorly differentiated carcinoma. Although levels of LDL, TC and TG are more in women in having breast cancer (all stages) but their intragroup comparision show that it is not related to the stage of breast cancer [Table/Fig-3].

Lipids Level	Control group (mean ±SD)	Well differentiated (mean ± SD) n=44	Moderately differentiated (mean ± SD) n=52	Poorly differentiated (mean ± SD) n=4
LDL (mg/dl)	83.87± 29.027	108.32 ± 24.695	105.27± 28.859	99.88±21.4
VLDL (mg/dl)	28.92± 11.103	29.86±13.5	30.54±13.13	27±11.5
HDL (mg/dl)	39.14± 6.524	38.34± 5.6	40.29± 5.4	39.63±11.5
Triglycerides (mg/dl)	112.08± 40.848	129.20± 37.92	130.94±38.04	129.75±55
Total cholesterol (mg/dl)	144.27± 31.505	180.86± 43.35	175.13± 44.63	182.50± 47.3

[Table/Fig-3]: Lipid profile of Women with Breast Cancer according to type of carcinoma
p-value < 0.05 – significant (S), > 0.05 – Non significant (NS)

DISCUSSION

Carcinoma breast is one of the major surgical problems in developing as well as developed nations. The relationship between the serum lipid profiles and breast cancer is unclear. Local eating habits such as increased fatty diet, increased alcohol intake, smoking, over body weight, country of residence, pregnancy, endogenous hormones, less exercise, environmental factors along with genetic predisposition are important factors linked with carcinoma of breast [10-13]. Early diagonosis is the best way to reduce mortality and morbidity associated with breast cancer. The present study was planned to evaluate the relationship between lipid profile and carcinoma of breast.

In the present study on comparison of LDL among study group and control group mean LDL among study group was 106.61mg/dl and in control group was 83.87 mg/dl with p-value 0.00 (< 0.05), which is significant. A previous study on various serum lipid levels, i.e., triglycerides, total cholesterol, alpha lipoprotein or high density lipoprotein (HDL)-cholesterol and beta lipoprotein or low density lipoprotein (LDL)-cholesterol, showed that mean levels of serum triglycerides, total cholesterol and LDL-cholesterol were significantly higher in breast cancer cases as compared to controls. They included 138 histologically proven cases of breast cancer along with 146 control females in their study [14]. In our study on comparison of LDL between premenopausal and postmenopausal study group and control group [Table/Fig-2] mean LDL levels among study group was significantly higher than control group.

In the present study on comparison of TG among study group and control group it was found that mean TG among study group was 130.91 mg/dl and in control group was 112.08 mg/dl with p-value 0.001(<0.05),which is significant. On comparison of TG between premenopausal and postmenopausal study and control groups [Table/Fig-2], difference is found to be significant. In the present study on comparison of TC among study group and control group mean TC among study group was 177.54 mg/dl and in control group was 144.27 mg/dl with p-value 0.00(<0.05), which is significant. On comparison of TC between premenopausal and postmenopausal study and control group's difference is also significant.

Similar results were confirmed by Owiredu et al., and found a significant increase in BMI, total cholesterol, triglycerides, and low density lipoprotein (LDL- C) in the breast cancer patients as compared to the controls. They also observed that BMI, LDL, total cholesterol and triglycerides were increased in both premenopausal and post menopausal breast cancer patients with HDL cholesterol remaining unchanged [15].

Bhat, et al., conducted study on 120 females including 60 breast cancer patients with age group 25 to 80 y and 60 healthy females as control with similar age range. They evaluated the role of lipid profile and BMI in breast cancer. They found significant increase in BMI, Total Cholesterol, triglyceride and low density lipoprotein (LDL-cholesterol) in the breast cancer patients as compared to the controls. BMI, TC and TG were increased in both pre-menopausal and post menopausal cases with HDL-cholesterol remaining unchanged [16].

On comparison of VLDL among study group and control group mean VLDL among study group was 30.27 mg/dl and in control group was 28.92 mg/dl with p-value 0.436 (>0.05), which is insignificant. On comparison of VLDL between premenopausal and postmenopausal study and control groups [Table/Fig-2], difference in VLDL levels were insignificant. On comparison of HDL among study group and control group mean HDL among study group was 39.36 mg/dl and in control group was 39.14 mg/dl with p-value 0.797 (>0.05), which is insignificant. On comparison of HDL levels between premenopausal and postmenopausal study and control groups [Table/Fig-2] difference is found to be insignificant.

Laisupasin et al., studied a total of 403 women. They were divided into two groups. It included 249 patients with early stage breast cancer and 154 normal controls. Serum lipid profiles (T-CHOL, TG, HDL-C, LDL-C and VLDL-C) were analysed. TG, LDL-C and VLDL-C levels in breast cancer group were significantly higher than normal controls group, whereas HDL-C and T-CHOL levels were not [17].

In the present study 44 patients belonged to well differentiated carcinoma (27 premenopausal and 17 Postmenopausal), 52 patients belonged to moderately differentiated carcinoma (19 premenopausal and 33 Postmenopausal) and four premenopausal patients belonged to poorly differentiated carcinoma [Table/Fig-3]. On comparison of lipid profile between well differentiated, moderately differentiated, poorly differentiated carcinoma no significant difference was found in lipid levels of different grades of carcinoma [Table/Fig-3]. A study to examine the role of alterations in lipid profile in women developing breast cancer also showed, values of T-C, LDL-C were significantly increased in all the four stages of breast cancer comparing to the control group. The values of HDL-C and VLDL were not affected. Lipid profile ratio showed insignificant variations when comparison was carried between stages results [18]. So, it may be concluded that lipid levels especially LDL, total cholesterol and triglyceride are increased in patients having breast cancer but have no role in the anaplasticity of carcinoma breast. However, a cohart study longitudinally following up women, started prior to any ailment, is required to ascertain these findings with confidence. Being a case control study and with lipid profile done only once not serially, is a limitation of this study.

CONCLUSION

Low density lipoproteins, Triglycerides and Total cholesterol were associated with breast cancer. However no association was there in different grades of carcinoma. So, it may be concluded that LDL, TG and TC may be having some role in aetiology of breast cancer. Therefore, early detection and control of these factors may help in reducing the incidence of breast cancer and ultimately social and economic burden on society.

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