Study of Alteration of Serum Lipid Profile in Breast Cancer

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Original Research Article

ABSTRACT

The relationship between lipid levels and breast cancer in women has given conflicting results and is often debatable. The aim of this study was to analyze the role of variation in lipid profile in women developing breast cancer. Study was carried out between July 2014 to December 2015. Plasma lipids (i.e. Total cholesterol (TC), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides (TG) were analyzed from 85 controls and 85 breast cancer patients with clinical and histopathological evidence, Venous blood was withdrawn with aseptic precaution from the cases and controls and estimations of lipid profile were done. Data was analyzed by Epi.Info. Statical software. p value of <0.05 was taken as significant for all statistical analysis. A significant rise in serum total cholesterol, low-density lipoprotein and ratio of total cholesterol: high density lipoprotein values were found, whereas high density lipoprotein and very low density lipoprotein were not affected significantly by the breast cancer.

KEY WORDS: breast, cancer, lipid profile.

INTRODUCTION:

Cholesterol and triglycerides are important lipid constituents of the cell. They play key roles in many essential physiological functions. Cholesterol is vital in maintenance of the structural and functional integrity of all biological membranes, cell growth and division of both normal and malignant tissue, the activity of membrane bound enzymes and stabilizing the DNA double helix. Lipoprotein receptors on the surface of the cells mediate cellular uptake & cholesterol regulation. In plasma, triglycerides and cholesterol are packaged into lipoproteins. These lipoproteins are then taken up and degraded by the cells. In some malignant diseases it has been demonstrated that blood cholesterol levels are significantly altered[1]. Altered serum cholesterol (high or low) levels in growing tissue could have a role in tissue carcinogenesis[1]. Lipids might be associated with cancers as they have an integral role in the maintenance of cell integrity. Although, raised lipids are strongly associated with the pathogenesis of coronary heart disease, researchers have also reported an association between plasma/serum lipids and lipoproteins with different types of cancers[2-3]. Understanding the evolving prognosis of breast cancer including the established risk factors, tumor markers and prognostic factors recent evidence narrows down on a potential role of metabolic diseases, which have been found to be an important factor in the genesis of breast cancer. The metabolic syndrome, a cluster of metabolic disorders that are the known risk factors of cardiovascular disease and diabetes, has been proposed to play a critical role in the risk[4] and prognos is of breast cancer [5].

The optimal lipid profile is a ratio of total cholesterol & HDL that is 3.5:1.A lipid profile should be done after a nine to twelve hour fasting. If fasting is difficult to achieve, the values for total cholesterol and HDL may still be useful[6]. If total cholesterol is 200 mg/dl or higher or HDL is less than 40 mg/dl, the individual will require having a follow up lipoprotein profile to determine LDL and triglyceride levels[7].The other parameters of lipid profile include VLDL

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which is not a measured value but a calculated parameter. It has been found that VLDL equals 20% of total triglyceride levels. VLDL is derived when triglyceride is divided by five. As many studies have shown that there is an alteration (increased or decreased) in triglyceride levels in patients suffering from different types of cancers & in progression of the disease, it has been postulated that the alteration in serum lipid profiles, in breast cancer, found to be common in females in developed countries could result from an increased production of tumor necrosis factor (TNF). Breast cancer occurs when cells in the breast tissue divide & grow without control[8].

Stage I breast cancer if the tumor less than or equal to two centimeter (2cm), neither axillary lymph node nor other groups reveal tumor deposits.

Stage II breast cancer The lymph nodes under the arm contain cancer and the cancer has not spread. In stage 2A, the tumor is less than 2 cm while in stage 2B the tumor is between 2 and 5 cm.

Stage III breast cancer Although there is no tumor in the breast, axillary lymph nodes contain cancer cells and are stuck together or to other structures, but there is no sign of cancer spread. In the stage 3A, the tumor is more than 5 cm. In stage 3 B the tumor is fixed to the skin or chest wall, the lymph nodes may or may not contain cancer cells, but there is no further spread, while in stage 3C, the tumor can be any size and has spread to lymph nodes in the armpit and under the breastbone, or to nodes above or below the collarbone, but there is no further spread.

Stage IV breast cancer The tumor can be of any size, the lymph nodes may or may not contain cancer cells, and the cancer has spread (metastasized) to other parts of the body such as the lungs, liver or bones. The relationship between lipids and breast cancer is unremarkable. Even though there are conflicting results in the association between lipid and risk of breast cancer. Studies, strongly supported by the international data collection from developed countries, show a strong relation between dietary fat & increased breast cancer risk[9].

The major aim of this study is to examine the role of developing breast cancer in altered lipid profile in women.

MATERIALS & METHODS:

The Study was conducted in central pathology laboratory of NKP Salve instate of Medical Sciences and research Centre after obtaining clearance from Ethical committee of the institute. Blood samples for Serum was obtained from 85 normal healthy

Table 1: Lipid profile values during different stages of breast cancer (mean ±SD).

	Stage	N	Mean	Std. Deviation	Std. Error	p value
TC	1	7	278.29	4.424	1.672	0.694
	2	23	273.83	15.848	3.304	
	3	47	277.30	10.253	1.496	
	4	8	276.00	14.948	5.285	
	Total	85	276.32	12.080	1.310	
HDL	1	7	51.14	2.854	1.079	0.004
	2	23	53.83	2.691	0.561	
	3	47	51.79	2.095	0.306	
	4	8	52.00	1.604	0.567	
	Total	85	52.31	2.450	0.266	
LDL	1	7	191.14	7.128	2.694	0.383
	2	23	185.65	15.098	3.148	
	3	47	190.51	9.179	1.339	
	4	8	189.75	13.307	4.705	
	Total	85	189.18	11.357	1.232	
VLDL	1	7	34.57	1.718	0.649	0.615
	2	23	35.09	1.998	0.417	
	3	47	35.49	2.339	0.341	
	4	8	34.75	1.832	0.648	
	Total	85	35.24	2.153	0.234	

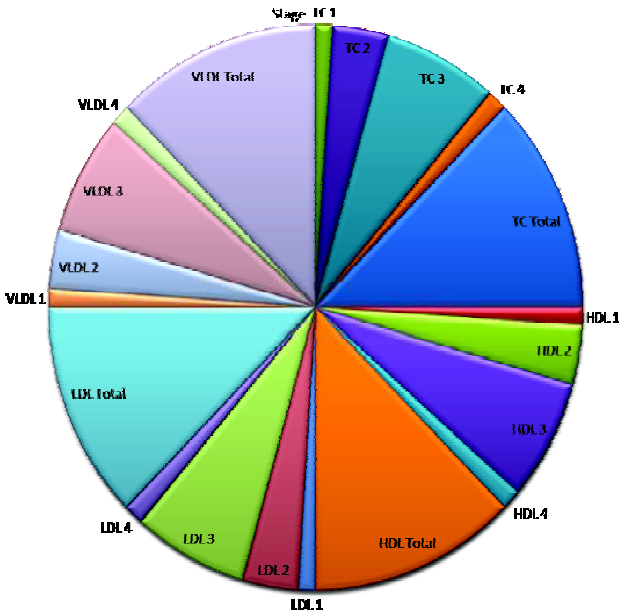

Figure 1: Lipid profile values during different stages of breast cancer.

females(control) and 85 patients with different stages of untreated breast cancer with clinical and histopathological evidence, admitted to surgical wards of this institute in the period between July 2014 and June 2015. The patients and control groups were of same age group. The excluding criteria in this study was patients suffering from diabetes mellitus, thyroid disorder, pregnancy, cardiac disease, obesity, alcohol abuse, renal disease[9]. Fasting 5 ml venous blood was drawn and serum was separated and analyzed within 6 hours. The lipid profile (TC, HDL, LDL, VLDL, and TC: HDL ratio) was analyzed in each sample. The estimations were done using readymade enzymatic kits for cholesterol, triglyceride, and high density lipoprotein[10]. Very low density lipoprotein and low density lipoprotein results were obtained by Friedewald's equation[11], in which:(VLDL = TG/5), (LDL = TC–HDL- VLDL) Obtained data were analyzed by using Epi. Info.Statical software p value of $p< 0.05$ is considered as significant for all statistical analysis[12].

Table 2: Effect of parity in breast cancer cases on lipid profile (mean ±SD).

		N	Mean	Std. Deviation	Std. Error	p value
TC	NP	3	280.67	11.015	6.360	0.655
	PP	11	278.45	13.597	4.100	
	MP	71	275.80	11.977	1.421	
	Total	85	276.32	12.080	1.310	
HDL	NP	3	53.67	2.082	1.202	0.269
	PP	11	51.36	2.730	0.823	
	MP	71	52.39	2.405	0.285	
	Total	85	52.31	2.450	0.266	
LDL	NP	3	192.00	11.269	6.506	0.647
	PP	11	191.73	13.528	4.079	
	MP	71	188.66	11.107	1.318	
	Total	85	189.18	11.357	1.232	
VLDL	NP	3	35.00	1.732	1.000	0.925
	PP	11	35.45	2.018	0.608	
	MP	71	35.21	2.210	0.262	
	Total	85	35.24	2.153	0.234	

[NP: Nulli Para, PP: Prini Para; MP: Multi Para]

RESULTS:

We observed various results of lipid profile. The values of TC, LDL, and TC/ HDL ratio were significantly increased in all the four stages of breast cancer compare to the control group. The values of group to evaluate the significant changes in various HDL and TC: HDL was not affected and showed

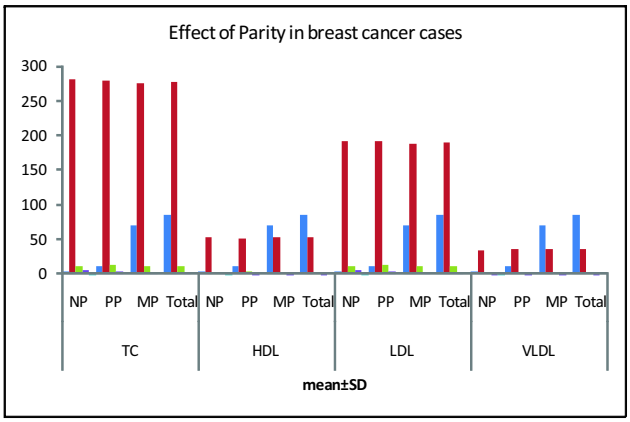

Figure 2: Effect of parity in breast cancer.

significant variations when comparison was done between control groups of same age with other factors and various stages of Carcinoma of breast (Table 1, 5, 6, 7).

Lipid profile & Cholesterol: HDL ratio revealed insignificant changed when compared to results among nullipara (NP) (no birth), primipara (PP) (one birth) and multipara (MP) (2–5 birth) (Table 2).The patients with breast cancer, in this study, were also classified into three age groups. The results of lipid profile and TC: HDL ratios were significantly changed when compared to the results between these 3 groups except in HDL which is insignificant [Table 3].The patients with breast cancer (all cancer stages) were categorized as premenopausal Pre M) and postmenopausal (Post M). The results of lipid profile and TC: HDL ratios were significantly changed when compared with the results of the two groups except HDL which is insignificant (Table 4).

DISCUSSION:

In the present study we compared four parameters of breast cancer patients with control modalities of the breast cancer. Breast cancer is the most common cancer found in women, accounting for one out of every three cancer diagnosis[13]. Malignant breast tumors are known to grow slowly. It has been

postulated that the tumor may have been growing for ten years by the time it can be felt as a lump. The risk of dying due to breast cancer can only be reduced if detected early[14]. In this study, as in Table 1, values of HDL, and TC/ HDL ratio were significantly increased in all the four stages of breast cancer (p value <0.05), while the values of TC, LDL and VLDL were not significantly changed. These findings are similar to those by Ray et al[15] and Michael et al[16]. But not with Patricia et al[17] who found that HDL levels were significantly decreased, and also with Kiran et al [18], who found that TG results (and VLDL levels) were significantly increased especially in stage IV patients with breast cancer. Increased TC and LDL values and decreased HDL values increases the risk of coronary heart disease[19].From the results and as demonstrated in Table 2 values of lipid profile & TC: HDL in relation to parity in breast cancer were insignificant when compared to the results of nullipara, primipara and multipara. These findings are similar to those of Tornberg et al[20]. Results from Table 3 reveal lipid profile, TC: HDL ratios which were highly significant among all 3 age groups except HDL. These findings are consistent with findings of Ray et al[21]. Observed values of Table 4 were highly significant when compared to groups of premenopausal and post menopausal breast cancer patients. These findings are consistent with Dongen et al [22].

Table 3: Effect of age in breast cancer cases on lipid profile (mean±SD)

	Age	N	Mean	Std. Deviation	Std. Error	p value
TC	<30	2	247.50	12.021	8.500	<0.001
	30-50	45	272.84	12.649	1.886	
	>50	38	281.95	6.710	1.089	
	Total	85	276.32	12.080	1.310	
HDL	<30	2	52.00	1.414	1.000	0.952
	30-50	45	52.38	2.863	0.427	
	>50	38	52.24	1.951	0.317	
	Total	85	52.31	2.450	0.266	
LDL	<30	2	175.00	32.527	23.000	0.002
	30-50	45	186.22	12.495	1.863	
	>50	38	193.42	6.211	1.008	
	Total	85	189.18	11.357	1.232	
VLDL	<30	2	33.00	1.414	1.000	<0.001
	30-50	45	34.31	1.869	0.279	
	>50	38	36.45	1.870	0.303	
	Total	85	35.24	2.153	0.234	

Table 4: Lipid profile values of breast cancer cases during pre and post menopausal status (mean ±SD).

	Menopausal status	N	Mean	Std. Deviation	Std. Error Mean	p value
TC	Pre M	50	281.32	5.734	0.811	<0.001
	Post M	35	269.17	14.960	2.529	
HDL	Pre M	50	52.22	2.160	0.305	0.702
	Post M	35	52.43	2.842	0.480	
LDL	Pre M	50	193.56	4.866	0.688	<0.001
	Post M	35	182.91	14.694	2.484	
VLDL	Pre M	50	35.86	2.060	0.291	<0.001
	Post M	35	34.34	1.984	0.335	

Table 5: Effect of age in control cases on lipid profile (mean±SD).

		N	Mean	Std. Deviation	Std. Error	p value
TC	<30	2	147.50	12.021	8.50	0.000
	30-50	45	181.29	17.208	2.56	
	>50	38	190.89	10.371	1.68	
	Total	85	184.79	16.147	1.75	
HDL	<30	2	49.50	2.121	1.50	0.559
	30-50	45	48.96	1.999	0.29	
	>50	38	49.42	1.995	0.32	
	Total	85	49.18	1.989	0.21	
LDL	<30	2	103.50	4.950	3.50	0.575
	30-50	45	103.33	13.491	2.01	
	>50	38	105.66	2.783	0.45	
	Total	85	104.38	10.019	1.08	
VLDL	<30	2	33.00	1.414	1.00	0.000
	30-50	45	34.31	1.869	0.27	
	>50	38	36.45	1.870	0.30	
	Total	85	35.24	2.153	0.23	
TC:HDL	<30	2	3.00	.000	0.00	0.000
	30-50	45	3.89	.318	0.04	
	>50	38	3.92	.273	0.04	
	Total	85	3.88	.324	0.03	

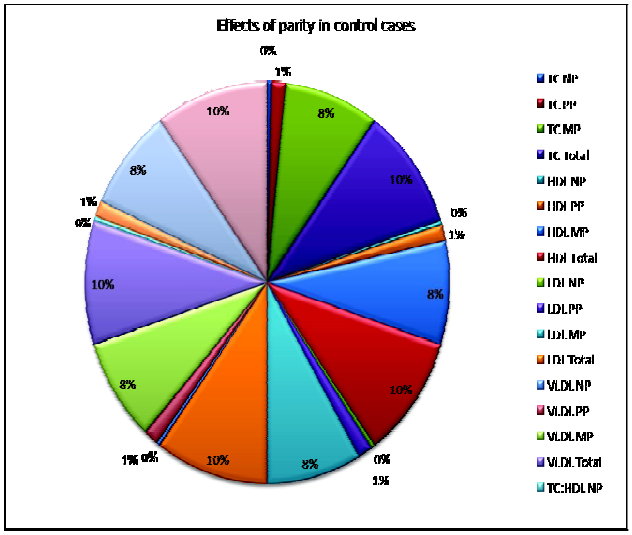

Figure 3: Effect of parity in breast cancer.

Table 6: Effect of parity in control cases on lipid profile (mean ±SD).

		N	Mean	Std. Deviation	Std. Error	p value
TC	NP	3	180.67	11.015	6.36	0.328
	PP	11	178.45	13.597	4.10	
	MP	71	185.94	16.572	1.96	
	Total	85	184.79	16.147	1.75	
HDL	NP	3	47.67	1.155	0.66	0.197
	PP	11	49.91	2.343	0.70	
	MP	71	49.13	1.934	0.23	
	Total	85	49.18	1.989	0.21	
LDL	NP	3	104.67	2.887	1.66	0.916
	PP	11	105.55	3.078	0.92	
	MP	71	104.18	10.891	1.29	
	Total	85	104.38	10.019	1.08	
VLDL	NP	3	35.00	1.732	1.00	0.925
	PP	11	35.45	2.018	0.60	
	MP	71	35.21	2.210	0.26	
	Total	85	35.24	2.153	0.23	
TC:HDL	NP	3	4.00	0.000	0.00	0.661
	PP	11	3.82	0.405	0.12	
	MP	71	3.89	0.318	0.03	
	Total	85	3.88	0.324	0.03	

Table 7: Effects of menopausal status in control cases on lipid profile (mean ±SD).

	Menopausal status	N	Mean	Std. Deviation	Std. Error Mean	p value
TC	Pre M	50	189.72	10.780	1.525	0.001
	Post M	35	177.74	19.744	3.337	
HDL	Pre M	50	49.20	1.874	0.265	0.897
	Post M	35	49.14	2.171	0.367	
LDL	Pre M	50	105.78	2.809	0.397	0.123
	Post M	35	102.37	15.152	2.561	
VLDL	Pre M	50	35.86	2.060	0.291	0.001
	Post M	35	34.34	1.984	0.335	
TC:HDL	Pre M	50	3.94	0.240	0.034	0.049
	Post M	35	3.80	0.406	0.069	

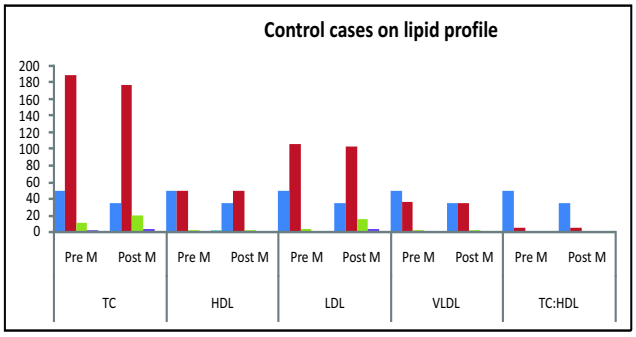

Figure 4: Effect of parity in breast cancer.

CONCLUSION:

The study shows that lipid profile and total cholesterol: HDL ratio was significantly raised in all stages of breast cancer patients against the controls.

ABBREVIATIONS

(TC) : Total Cholesterol
(NP) : Nullipara
(TG) : Triglycerides
(PP) : Primipara
(HDL) : High-density lipoprotein
(MP) : Multipara
(LDL) : Low-density lipoprotein
(Pre M) : Premenopausal
(VLDL) : Very low-density lipoprotein
(Post M) : Post menopausal

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