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SERUM BIOCHEMICAL PROFILE OF BREAST CANCER PATIENTS

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ABSTRACT

Cancer account for high morbidity and mortality rate throughout the world. In the present investigation, the levels of serum glucose, total cholesterol, triglyceride, creatinine, ferritin and alkaline phosphatase were higher than the normal range while the level of HDL-Cholesterol was lower than the normal range. The random blood glucose was 169.0±88.74 mg/dl. The total cholesterol, triglyceride and HDL-Cholesterol levels were 194.75±31.26 mg/dl, 238.25±93.87 and 30.5±11.6 mg/dl respectively. The plasma total protein and albumin levels were 7.68±0.22 g/dl and 4.4±0.54 g/dl respectively. The total and direct billirubin levels observed were of 0.45±0.37 mg/dl and 0.33±0.19 mg/dl. The observed BUN was 9.2±3.74 mg/dl while uric acid was 5.32±1.22 mg/dl. The observed value for creatinine, calcium, phosphorus and ferritin were 1.6±0.45 mg/dl, 10.05±0.93 mg/dl, 3.28±0.76 mg/dl and 96.67±30.64 ng/mL respectively. The level of some diagnostically important enzymes in the plasma were 127±33.38 U/L, 34.25±10.91 U/L, 31.5±8.8 U/L, 25.69±8.31 U/L, 133±7.35 U/L, 314.25±64.0 U/L and 23.25±9.25 U/L for alkaline phosphatase, gamma glutamyl transferase, SGOT, SGPT, LDH cholinesterase and CK-MB respectively.

KEY WORDS: Breast cancer, HDLC, triglyceride, calcium, alkaline phosphatase.

INTRODUCTION

Cancer account for high morbidity and mortality rate throughout the world. Cancer detected early can potentially be cured when the tumor is small enough to be completely removed surgically. Unfortunately, most cancers do not produce any symptoms until the tumors are either too large to be removed surgically or cancerous cells have already spread to other tissues i.e. metastasis has taken place. Breast cancer is a worldwide major public health problem in women population, affecting both the developing as well as developed countries and comprising 18% of all female cancers.[1] More than 1.2 million cases are diagnosed every year, affecting 10-12% of the female population and accounting 500,000 deaths per year worldwide.[2] Women with a first full-term pregnancy after age 30, and women who have never borne a child have about a two to three-fold increased risk of breast cancer compared to women having a full-term pregnancy before age 20. [1] It is well established that women having low-income and worse socio-economic conditions are at increased risk to develop breast-cancer and have lower rates of survival in already exited breast cancer.[3]

The change in the serum biochemical profile among the breast cancer patients have been reported though the reports are scanty. The increase in serum total cholesterol in patients with breast cancer have been reported by Zielinski *et al*., Qi *et al*., Chow *et al*. and Owiredu *et al*.[4-7] Similarly, triglyceride level is also significantly higher in both pre and postmenopausal cancer patients.[7-9] Kokoglu and associates,[10] also observed high serum triglycerides levels in breast cancer patients. The high concentration of triglycerides may lead to a decreased level of sex hormone-binding globulin, resulting in higher amount of free estradiol, which may likely to increase breast cancer risk.[11] However, HDL-C levels decreases in both pre and postmenopausal cancer patients. Yadav and his associates,[12] and Ray *et al.*[13] reported significantly decreased in plasma HDL-C concentration in breast cancer patients.

Iron is an essential element but in excess may be harmful. Iron overload is connected with increased risk for some malignant diseases, among them breast cancer.[14] Iron is necessary for cell proliferation and iron metabolism is influenced by estrogen hormones. Interactions between iron and estrogen may synergistically promote breast cancer. [15] The elevated iron and increased ferritin concentration may have a protective role, preventing oxidative stress caused by excess iron. [16, 17] Ferritin is a sensitive indicator of iron

deficiency and concentration may increase in case of iron overload (haemochromatosis or haemosiderosis), infection or inflammation, neurodegenerative disorders, malignancies and destruction of liver tissue.[18] The present investigation was undertaken to assess the biochemical changes among the breast cancer patients.

MATERIALS AND METHODS

The present study was conducted with the established and histopathologically confirmed breast cancer patients being treated at Regional Cancer hospital and Research centre, Zemabawk, Aizawl.

The blood samples (5 ml) each were collected from each patient aseptically in heparinized tubes. The samples were then centrifuged at 2500 g for 10 min. The plasma of the samples were then collected in sample vials and kept in the freezer till the samples are analyzed for the biochemical profile.

The collected samples were analyzed for various biochemical parameters including blood sugar, total cholesterol, triglycerides, HDL-C, total protein, albumin, globulin, A:G ratio, billirubin (direct & total), creatinine, BUN, uric acid, calcium, phosphorus, cholinesterase, SGOT, SGPT, alkaline phosphatase, gamma glutamyl transferase, lactate dehydrogenase, amylase etc. All the biochemical parameters were analyzed on a fully automatic dry clinical analyzer (Fujifilm-4000i) while the ferritin was estimated spectrophotometrically. The observed results were then analyzed using a suitable statistical method.

RESULTS

The observed biochemical parameter in breast cancer patients is given in the table 1.

Table 1: Serum Biochemical profile of breast cancer patients

Sl. No.	Test	Observed value	Range	Normal Reference range
01	Glucose (mg/dl)	169.00±88.74	96-276	70-110 (Fasting) 110-150 (PP)
02	Total Cholesterol (mg/dl)	194.75±31.26	152-220	150-219
03	Triglyceride (mg/dl)	238.25±93.87	146-348	50-149
04	HDL-Cholesterol (mg/dl)	30.5±11.6	17-44	37-67 (Male) 40-71 (Female)
05	Total Protein (g/dl)	7.68±0.22	7.4-7.9	6.7-8.3
06	Albumin (g/dl)	4.4±0.54	3.7-5.0	3.8-5.0
07	BUN (mg/dl)	9.2±3.74	4.9-13.7	8-23
08	Uric Acid (mg/dl)	5.32±1.22	4.1-6.7	4.0-7.0 (Male) 3.0-5.5 (Female)
09	Creatinine (mg/dl)	1.6±0.45	1.0-2.0	0.6-1.1
10	Bilirubin (Total) (mg/dl)	0.45±0.37	0.2-1.0	0.1-1.2
11	Bilirubin (Direct) (mg/dl)	0.33±0.19	0.2-0.6	0.1-0.4
12	Calcium (mg/dl)	10.05±0.93	8.8-10.9	8.4-10.2
13	Phosphorus (mg/dl)	3.28±0.76	2.7-4.3	2.6-4.4
14	Alkaline Phosphatase (U/L)	127±33.38	85-165	32-111
15	GGT (U/L)	34.25±10.91	26-50	16-73
16	SGOT (U/L)	31.5±8.8	21-41	8-38
17	SGPT (U/L)	25.69±8.31	18-36.67	4-44
19	LDH (U/L)	133±7.35	127-143	106-211
20	Cholinesterase (U/L)	314.25±64.00	242-373	170-420
21	CKMB (U/L)	23.25±9.25	17-37	<25
22	Ferritin (ng/mL)	96.67±30.64	75-140	53 (Premenopausal) 105 (Post-menopausal)

The values observed in the present investigation were on higher side for glucose, triglyceride, creatinine, calcium and alkaline phosphatase while the observed level of HDL-Cholesterol was lower than the normal range. The random blood glucose level was 169.0±88.74 mg/dl and the level ranges between 96.0 and 276.0. The total cholesterol, triglyceride and HDL-Cholesterol levels were 194.75±31.26 mg/dl, 238.25±93.87 and 30.5±11.6 mg/dl respectively. The level of total cholesterol ranged from 152 to 220 while the level of triglyceride ranges between 146 and 348 and that of HDL-Cholesterol from 17 to 44. The plasma total protein and albumin levels were 7.68±0.22 g/dl and 4.4±0.54 g/dl respectively and levels ranges between 7.4 and 7.9 for total protein and 3.7 and 5.0 for albumin. The total and direct billirubin levels observed were of 0.45±0.37 mg/dl and 0.33±0.19 mg/dl. The level of total billirubin and direct billirubin varies from 0.2 to 1.0 and 0.2 to 0.6 respectively. The observed blood urea nitrogen (BUN) level was 9.2±3.74 mg/dl and level ranges between 4.9 and 13.7. The uric acid level observed was 5.32±1.22 mg/dl. The level of uric acid observed ranges from 4.1 and 6.7. The observed

value for creatinine was 1.6±0.45 mg/dl and the level ranges between 1.0 and 2.0. Plasma calcium and phosphorus levels observed were 10.05±0.93 mg/dl and 3.28±0.76 mg/dl. The plasma calcium level ranges from 8.8 to 10.9 while the phosphorus level ranges between 2.7 and 4.3. The level of plasma ferritin level was 96.67±30.64 and the level varies between 75 and 140.

The level of some diagnostically important enzymes in the plasma were 127±33.38 U/L, 34.25±10.91 U/L, 31.5±8.8 U/L, 25.69±8.31 U/L, 133±7.35 U/L, 314.25±64.0 U/L and 23.25±9.25 U/L for alkaline phosphatase, gamma glutamyl transferase, SGOT, SGPT, LDH cholinesterase and CK-MB respectively. The observed values for alkaline phosphatase ranged from 85 to 165, GGT from 26 to 50, SGOT from 21 to 41, SGPT from 18 to 36.67, LDH from 127 to 143, Cholinesterase from 242 to 373 and CK-MB from 17 to 37.

DISCUSSION

The observed random blood glucose level, 169.0±88.74 mg/dl in the present investigation is higher than the normal reference range. Further, the level ranges between 96.0 and 276.0 mg/dl. The increase in serum glucose level among the breast cancer patients is also reported earlier.[19-21]

The total cholesterol observed among the breast cancer patients in the present investigation was 194.75±31.26 which is within the normal range. This finding is in agreement with the report of non-significant change in total serum cholesterol of postmenopausal case reported by Haritwal et al. Gaard *et al*. and Kokoglu *et al*.[22-24] However, this is in contrast to reports of Qi *et al*. and Owiredu *et al*.[5, 7] who have reported the elevated total serum cholesterol with increased breast cancer risk. Hence, the association between total serum cholesterol level and breast cancer risk still seems to be controversial and published results are inconsistent. In spite of these, a major link has been established between cell growth and cholesterol biosynthesis. If cholesterol synthesis is inhibited and no exogenous cholesterol is available, cell growth will be blocked.[25, 26] Buchwald.[25] proposed that cholesterol inhibition either by decreasing cholesterol availability (lowering of plasma cholesterol) or by decreasing intracellular cholesterol synthesis could inhibit tumor cell growth and possibly prevent carcinogenesis.

The HDL-Cholesterol level observed among the breast cancer patients were lower than the normal range. This finding is in agreement with other findings in literature.[12, 13, 22] HDL-C levels were lower in both pre and postmenopausal cancer patients than in controls. [12] Ray and associates.[13] reported significantly decreased in plasma HDL-C concentration in breast cancer patients. Haritwal and his associates.[22] reported that in 52.5% of breast cancer patients, HDL-C level was found to be <35 mg/dl as compared to 4.3% of the control group which was found to be statistically significant (P<0.001). However, this finding is in contrast to observations of Moorman *et al*. and Owiredu *et al*. [27, 7] Owiredu and coworkers [7] showed unchanged in concentration of HDL-C in both pre and postmenopausal women with breast cancer. The low HDL-C is related to increased levels of several cancer-promoting hormones (e.g., androgens, estrogens, insulin, and IGF-I), the observed association may reflect the relative importance and mutual dependence of different disease pathways in malignant breast tumors. Changes in serum HDL-C level induced by sex steroids may be mediated by changes in hepatic lipase; the activity of enzyme is regulated by sex steroids. [28] Low serum HDL-C level is related to increased level of free biologically active estradiol throughout an entire menstrual cycle.[29]

The serum triglyceride level observed was significantly higher among breast cancer patients. The observed level was 238.25±93.87 mg/dl and level ranges from 146 to 348. The observed increased serum triglyceride level in breast cancer patients is in agreement with other findings. Yadav and his associates.[12] reported that triglyceride levels were significantly higher in both pre and postmenopausal cancer patients. Peela and coworkers.[30] reported significantly higher triglyceride level in women with node-negative invasive cancer. Bani and associates.[8] and Abu-Bedair and his colleagues.[9] reported significantly increased triglyceride level in postmenopausal cancer patients. Gooden and associates.[31] had reported that women with high serum triglyceride levels have an increased breast cancer risk. The high concentration of triglycerides may lead a decreased level of sex hormone-binding globulin, resulting in higher amount of free estradiol, which is likely to increase breast cancer risk.[11] The levels of serum total protein, albumin, BUN, uric acid, billirubin (Total & Direct), calcium and phosphorus observed in the present investigation were within normal ranges however the level of creatinine was higher than the normal value. The level of plasma ferritin level was 96.67±30.64 (ng/ mL) and the level varies between 75 and 140. The observed level is on higher side of the normal range. Increased ferritin content was earlier reported for malignant cells. Ferritin concentrations may be a prognostic indicator in some patients with breast cancer.[14]

Among the diagnostically important enzymes, the level of alkaline phosphatase was higher than the normal range while the levels of GGT, SGOT, SGPT, LDH, Cholinesterase and CK-MB were within the normal range. The observed serum alkaline phosphatase activity among the breast cancer patients was 127±33.38 and the level ranges between 85 and 165. Similar to present finding, the increase in the ALP activity in the cancer patients was also reported by other workers. [32-36] However Misra and co-workers [37] reported a non-significant rise in alkaline phosphatase and GGT in non-metastatic cases.

CONCLUSION

Cancer account for high morbidity and mortality rate throughout the world. In the present investigation, the levels of serum glucose, total cholesterol, triglyceride, creatinine, ferritin and alkaline phosphatase were higher than the normal range while the level of HDL-Cholesterol was lower than the normal range.

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