Changes in Haematological, Biochemical and Serum Electrolytes Markers in Women Breast Cancer Patients

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Abstract

Objective: The aim of this study is to evaluates the effects of breast cancer states on Some blood biomarkers in female patients. Materials and methods: 16 cases of women breast cancer were chosen, 20 age matched controls were chosen. Blood samples were collected from them and blood glucose, lipid profile, Sodium, Potassium and Chloride levels were measured. Also, RBC, HGB, HCT, LYM, MON and EOS levels in blood was measured.

Results: results of biochemical parameters revealed that a significant increase in blood glucose (P <0.05) and calcium (P <0.01) level and a significant decrease (P <0.01) in serum potassium concentration and no significant change in serum lipid profile, Na and Cl level in women with breast cancer compared to controls. On the other hand, Results of the haematological analysis show that RBC (p <0.001), HGB (p <0.01), HCT (p <0.05), lymphocyte and eosinophil (p <0.01) level are significantly decreased and monocyte level is significantly elevated (p <0.01) in patients group as the control group. Conclusion: In conclusion, the present study suggests that the importance of some haematological and serum electrolyte parameters as markers of diagnosis and therapeutic follow-up of the breast cancer disease in women.

Keywords: Breast cancer; Haematological parameters; Electrolyte.

Introduction

Breast cancer is the type of cancer that develops from breast tissue; it is especially common among women and is one of the most studied diseases, largely because of its high mortality rate [1]. Very difficult to determine the cause of breast cancer, but Studies scientists have shown that some person-specific characteristics or behaviors were more often observed in women who had breast cancer than in other women [2]. Risk factor to obtain breast cancer increases with inherited genetic mutations, such as in the BRCA1 and BRCA2 genes, and a personal or family history of breast cancer [3]. Other risk factors include never having children, greater height, benign breast disease, early menarche, late menopause (after age 54), ionizing-radiation Exposure, postmenopausal obesity, physical inactivity, and alcohol intake [4, 5]. Breastfeeding, moderate/vigorous physical activity, and maintaining a healthy body weight decrease breast cancer risk [6, 7]. High breast tissue density [8]. In Algeria, breast cancer is the first leading cancer for women. With 11,000 new cases/year. Epidemiological features of breast cancer appear to be different in developing countries compared to Western countries [9]. Breast cancer care consists of a multidisciplinary approach of surgery, radiation, and systemic therapy including chemotherapy. Biological markers for breast cancer are biomolecules that result from cancer-related processes and are associated with particular clinical outcomes; they thus help predict responses to therapy [10]. The treatment options available are surgery, radiation, chemotherapy, immunotherapy and targeted therapy [11]. With this background the present study was undertaken to assess the level of biochemical and hematological markers and the alterations in the levels of serum electrolytes in women Breast cancer patients and normal subjects.
Subject and Methods

Subject

Ethical approval (Appendix) was sought and approved by the Ethical Committee of the Department of Cellular and Molecular Biology, Faculty of natural science and life, University of El Oued. We studied is carried out on 36 volunteer women of age between 25 -80 years, were divided into two groups; a group of 20 healthy control women with mean age 42.82 ± 1.20 years, the other group of 16 patients women diagnosed and treated breast cancer with mean age 45.48 ± 1.37 years.

Inclusion Criteria

Patients who had clinical diagnosis and laboratory findings of breast cancer disease for more than three months evidenced

Exclusion Criteria

To eliminate the factors which might affect haematological parameters, we excluded all diabetics, anemia and other chronic diseases subjects from patient groups and healthy controls.

Methods and Laboratory Investigations

Fasting blood samples were collected and placed into containing tubes. Blood was transferred into EDTA tubes for haematological studies and the serum were obtained after centrifugation at 3000 × g for 5 min, removed and retained for assay of the level of glucose, biochemical and all the electrolytes parameters. Serum samples were stored at -20ºC until analysis. Hematological analysis (FNS) is performed by the hematology autoanalyzer (Sysmex). Serum Electrolyte levels (Na+, k+ & Cl-) were determined by Electrolyte Analyzer (Easylute PLUS Na/K/Cl de Medica). Triglyceride (TG), Total cholesterol (TC), and Total protein concentrations were measured using commercial kits (Spinreact) (refs: TG-1001311, TC-1001090 and total proteins-1001291).

Statistical Methodology

The reported data are the means of measurements and their standard error of mean (SEM) values. The results of cases and controls were compared by student test using SPSS software.

Results and Discussion

Biochemical Mmarkers

Our results obtained concerning biochemical parameters (table 01) revealed that a significant increase (P <0.05) in blood glucose level in women with breast cancer compared to controls. Also, our results show that there is no significant change (P> 0.05) concerning the serum lipid profile parameters in the groups studied. Accumulation of TGs, TC and LDL-C is one of several risk factors in Coronary Heart Disease (CHD) [12]. That elevated glucose consumption is a necessary component of carcinogenesis. Specifically Gillies RJ et al. [13] propose that glycolysis is elevated because it produces acid, which provides an evolutionary advantage to cancer cells. In 2002, the prospective Morimoto et al. study found that high fasting glucose was a risk factor for breast cancer, further supported by a second Morimoto et al. study with longer follow-up [14].

Table 01: Mean glucose level and biochemical markers in control and patient.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control N=20</th>
<th>Patients N=16</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (g/l)</td>
<td>0.7865±0.0308</td>
<td>1.093±0.121</td>
<td>0.024</td>
</tr>
<tr>
<td>Cholesterol (g/l)</td>
<td>1.8330±0.0957</td>
<td>1.916±0.126</td>
<td>0.522</td>
</tr>
<tr>
<td>Triglyceride (g/l)</td>
<td>0.896±0.186</td>
<td>1.048±0.173</td>
<td>0.393</td>
</tr>
<tr>
<td>HDL cholesterol (g/l)</td>
<td>0.4906±0.0323</td>
<td>0.4520±0.0319</td>
<td>0.246</td>
</tr>
<tr>
<td>LDL cholesterol (g/l)</td>
<td>1.1900±0.0950</td>
<td>1.205±0.113</td>
<td>0.899</td>
</tr>
</tbody>
</table>
Serum Electrolytes Markers

The result of blood electrolyte analysis (table 02.) shows that serum potassium concentration is significant decrease (P <0.01) and serum calcium level is significant increase (P <0.01) in the breast cancer group against the control. On the other hand there were no significant change in serum Na and Cl concentration. Yadav & Khodke, (2015) show that the serum potassium levels in cancer patients was slightly higher than the normal but statistically significant (p <0.05) as compared to normal healthy controls [15]. The primary role of electrolytes lies in the maintenance of body ionic and water balance. Thus the requirements for strong ions that have characteristic effects on body fluids homeostasis, cannot be considered individually because it is the overall balance that is important [16]. Higher levels of serum potassium may be due to several reasons such as side effects of chemotherapeutic drugs, breakdown of tumor cells, hormones produced by certain types of tumors and extensive replacement of the adrenal glands by tumors can all result in high potassium blood levels. According to Yan Cui and Thomas E. Rohan that the importance of calcium in carcinogenesis derives from its participation in regulating cell proliferation, differentiation, and apoptosis [17]. Russo & Russo, (2001) also found that there is increasing in the concentration of calcium decreases cell proliferation and induces differentiation of mammary cells in experimental studies [18]. Evidence is available that calcium at least partially exerts its anticarcinogenic effects through vitamin D. For example, calcium is one of the key mediators of apoptosis induced by vitamin D compounds in breast cancer cells [19].

Table 02: Serum electrolyte and calcium level in patients group and control.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control N=20</th>
<th>Patients N=16</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Na (mmol/l)</td>
<td>140.92± 1.15</td>
<td>139.84±0.66</td>
<td>0.119</td>
</tr>
<tr>
<td>Serum K (mmol/l)</td>
<td>4.714±0.134</td>
<td>4.214±0.131</td>
<td>0.002</td>
</tr>
<tr>
<td>Serum Cl (mmol/l)</td>
<td>105.69±1.39</td>
<td>104.41±0.79</td>
<td>0.130</td>
</tr>
<tr>
<td>Serum Ca (mg/l)</td>
<td>83.50±1.81</td>
<td>90.38±2.19</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Haematological Markers

Seen from Table 03, Results of the hematological analysis show that the erythrocyte line (RBC, HGB, HCT) is significantly decreased (p <0.001; p <0.01 and p <0.05) respectively in patients group as the control group. Our results are in agreement with the results of Shrivastava et al. [20] that got that found a significantly lower of hemoglobin level and RBC count in women with breast cancer as compared to control healthy subjects. Moreover our results illustrate that a significant elevation (p <0.01) of monocyte, and a significant decrease of lymphocyte (p <0.01) and eosinophil (p <0.001), in the patients to the controls. The total and differential WBC and lymphocyte count is an important auxiliary diagnostic test as changes occur with systemic inflammation and other diseases [21]. KHAN et al. [22] also found the percentage of monocytes and lymphocytes were agreement with results of the present study. Preeti et al. (2016) showed that No significant variation was observed for neutrophils, Eosinophil and monocyte count during the different courses of chemotherapy treatment in cancer patients [23]. Nitric oxide (NO) is a highly reactive free radical with a multitude of organ which induce oxidative stress [24]. Oxidative stress is defined as an imbalance in the balance between antioxidants and pro-oxidants in favor of antioxidants. [25]. There is a complex interaction between antioxidants and oxidants such as reactive oxygen species, which modulates the generation of oxidative stress [26]. The results found were opposite to those observed in Swati et al (2017) [27] who showed that platelet were non-significant change as compared to control healthy subjects. Variation in hematological parameters in breast cancer patients may be due to the increase in the levels of pro-inflammatory cytokines Including Interlukin-1 and Interlukin-6 and Tumor necrosis factor [28].
Table 03: Hematology parameter in the blood of control women and cancerous women.

<table>
<thead>
<tr>
<th>Parametre</th>
<th>Control N=20</th>
<th>Patients N=16</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red blood cell (RBC) (10^6/ul)</td>
<td>4.2200±0.0674</td>
<td>3.628±0.131</td>
<td>0.000</td>
</tr>
<tr>
<td>Hemoglobin (HGB) (g/dl)</td>
<td>11.320±0.295</td>
<td>10.013±0.364</td>
<td>0.003</td>
</tr>
<tr>
<td>Hematocrit (HCT) (%)</td>
<td>35.245±0.839</td>
<td>31.44±1.01</td>
<td>0.002</td>
</tr>
<tr>
<td>Lymphocytes (10^3/ul)</td>
<td>2.110±0.179</td>
<td>1.515±0.161</td>
<td>0.002</td>
</tr>
<tr>
<td>Monocytes (10^3/ul)</td>
<td>0.3600±0.0331</td>
<td>0.5467±0.0609</td>
<td>0.008</td>
</tr>
<tr>
<td>Eosinophyle (10^3/ul)</td>
<td>0.2125±0.357</td>
<td>0.680±0.0153</td>
<td>0.000</td>
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</tbody>
</table>

Conclusion

In conclusion, the present study suggests that the biochemical parameters are of little importance in the prognosis of breast cancer but show the importance of hematological parameters as markers of diagnosis and therapeutic follow-up of the disease. Also, electrolyte disturbances need to be monitored and treated appropriately to avoid the ill effects resulting from the changes in the serum levels of these cations.

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References


