ORIGINAL ARTICLE

Evaluation of Oxidative Stress Biomarkers in Patients with Breast cancer Compared with Healthy Subjects

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ABSTRACT: Breast cancer is one of the most common malignancies in women with the highest mortality rate in women. Oxidative stress characteristics play a large role in the risk factor of tumors. In this study, we measure the oxidative stress indices of malondialdehyde(MDA), Total antioxidant capacity(TAC) in women with breast cancer compared to healthy subjects.This case-control study was performed on 30 women with a definitive diagnosis of breast cancer and 30 healthy women. The subjects were matched in terms of age and sex and then blood samples were taken from them and collected in vials EDTA .Oxidative stress was measured by spectrophotometry. MDA level was significantly higher in cases (2.48 ± 0.73) compared to controls (1.4 ± 0.63). In contrast, there were lower TAC levels in cases compared to controls and was statistically significant . The data showed that higher MDA levels in BC patients than in the control group. The results suggest that increased serum MDA and decreased TCA activity may be due to oxidative stress, which may play an important role in BC formation.

INTRODUCTION

Many factors contribute to cancer, including genetic factors, hormones, gestational age, obesity, smoking, inactivity and exercise, and alcohol consumption. One of the most common cancers in the world and in the female population is breast cancer, which is the cause of the highest mortality rate in women, especially in Iran, which is associated with factors such as increased oxidative stress factors, decreased antioxidant system and the production of reactive oxygen species. Reactive oxygen species, which are essential for cellular processes, are produced in small amounts as a result of normal metabolism in the cell [1, 2]. However, overproduction of these species leads to oxidative damage to cells, resulting in lipid peroxidation and mutagenicity and a risk factor for cancer. In the face of these mechanisms, the body produces free radicals, including enzymatic and non-enzymatic components[3-5]. Increased reactive oxygen species by stimulating DNA damage, genetic mutations, inhibition of apoptosis, invasion and metastasis affect cancer cells and can therefore be the best antioxidant / oxidant prognostic factors in the diagnosis and treatment of many Cancers are effective. The oxidation of malondialdehyde marker is an active oxygen species that plays an important role in the onset and progression of cancer and causes oxidative DNA

damage and is associated with tumorigenesis and mutagenicity of tumors and many neurodegenerative disorders. Damage caused by reactive oxygen species can be minimized by examining enzymatic and non-enzymatic factors of oxidative stress.Many studies have shown the role of oxidative stress indicators in breast cancer. In fact, damage caused by the interaction of oxidative stress with protein and lipid molecules releases metabolites such as MDA and TAC, which plays a major role in the risk factor for some tumors[6,7,8]. In this study, we examine the rate of MDA and TAC in women with breast cancer in the female population of Sistan and Baluchestan province and compare with healthy individuals.

MATERIALS AND METHODS

This study was Case-Control (30 people) study wiped out Zahedan city (Sistan and Baluchestan province).

Study population

Patients group

Blood samples were taken from 30 patients with diagnosed and pathological breast cancer that they had no other known cancers or systemic diseases and are currently being treated. The standards for entering the study were women with BC whose disease was confirmed by a pathologist Patients didn't have secondary malignancies and congenital chromosomal abnormalities. Besides, the demographic information of patients including age, height, weight, and place of residence was performed and BMI was calculated.

Control group

Blood samples were collected from 30 healthy women in Zahedan city who had no known cancers or systemic disease.

Samples collection

The cases matched healthy controls consistent with age, sex, and ethnicity. 7 ml of blood samples were collected in non-coagulated tubes and stored for 25 minutes at 25^0C. Then, at 3000 rpm, the blood was centrifuged during a refrigerated centrifuge for 10 minutes, carefully collected the serum and stored at -70^0C until oxidative stress enzymes are measured. Oxidative stress enzymes are measured consistent with standard protocols.

Malondialdehyde assay

Lipid peroxidation analysis was focused on evaluating MDA levels, using the thiobarbituric method. MDA levels is usually determined on the basis of its reaction to thiobarbituric acid (TBA), where one MDA molecule with two TBA molecules reacts at high temperatures and under acidic conditions to give colorimetrically measured pink chromophores (MDA-TBA adduct) at 535 nm

Total antioxidant capacity Assay

Serum TAC was measured employing a billboard kit following the manufacturer's protocol (ZellBio GmbH, Germany) on the thought of the oxidation reduction colorimetric assay at a wavelength of 490 nm. TAC level was considered because the quantity of antioxidant within the sample that was compared with vitamin C action as a typical . This method can determine TAC with 0.1 mM sensitivity (100 μmol/L). The intra- and inter-assay variation co-efficient is claimed to be a but3.4% and 4.2%, respectively.

Statistical analysis

Results were expressed as mean ± SD. Statistical comparisons between groups were performed by Student t test. A *P* value of <0.05 was considered statistically significant. Statistical analysis was carried out using version 21 of SPSS software (SPSS Inc., Chicago, IL, USA).

RESULTS

Blood serum samples from 30 diagnosed BC patients and healthy volunteers have been analyzed, TAC level and MDA activity have been measured.BC patients showed

significantly lower TAC levels compared to a control group of healthy group . There was a statistically significant difference between case and control groups so that MDA

analysis indicated a significant increase in MDA activity in the BC group compared with the healthy group (Table 1).

Table 1. Comparison of (TCA) levels and (MDA) activity in study and control groups.

Parameter	Control (N = 30)	Cases (N = 30	P value
TAC	475±212	321±363	0.032
MDA	1.4±0.631	2.48±0.73	0.012

DISCUSSION

One of the most common cancers in the female population of the world is breast cancer, which is diagnosed in women over the age of 50 by mammography. Various studies have shown that reactive oxygen species are contributing factors to the tumorigenesis and mutagenesis of many cancers. One of the active oxygen species in breast cancer is the malondialdehyde marker, which is the end product of lipid peroxidation and is effective in many neurodegenerative disorders with DNA damage and tumorigenesis. There was a lack of balance in the redox homeostasis are involved in carcinogenic processes[9]. Oxidative stress may be due to overproduction of ROS or Insufficient antioxidant capacity. MDA is one of the markers of lipid peroxidation which is caused by free radicals and research has shown the link between carcinogenicity and lipid peroxidation. Studies have shown that the measurement MDA which is due to lipid peroxidation is higher in breast cancer and the results are the same as the results of our research. Studies have also shown that MDA and catalase levels are reduced in breast cancer patients. In this study, the level of MDA in patients with breast cancer was higher compared to healthy individuals, and in line with the results of our study[10]. The results of Rashich et al. Showed that the serum level of malondialdehyde in patients with breast cancer was higher in the fourth stage of their metastasis, which was consistent with the results of our study[11]. The results of Kilic et al. Comparison with healthy individuals was higher, which was consistent with the results of our study[12]. The results of Chandramathi et al.'s study also showed that the level of MDA in patients with breast cancer was higher[13]. TAC can be effective as an antioxidant marker caused by free radicals in the actual risk of cancer. The major constituents

of plasma TAC are sulfhydryl, urate, ascorbate, alpha-tocopherol, and bilirubin. The results of our study showed that the level of TAC in breast cancer patients was significantly lower than the healthy group, in this regard, the results of research by Halvorsen et al. Were consistent with our results[14]. Studies by Uraj et al[15]. Showed that in a group of breast cancer, the levels of enzymatic and non-enzymatic antioxidants decreased, which was consistent with the results of our study[16,17,18,19]. However, studies have also shown that the level of antioxidant enzymes in cancer patients has increased, and the reason may be that the production ROS to eliminate excess free radicals produced induces antioxidant enzymes.Studies have shown that MDA, which is caused by the breakdown of lipid peroxidation, has increased in various cancers. Lipid peroxides and their products can cause damage to biological macromolecules initiating carcinogenesis.[20-22] Our study showed that TAC levels in breast cancer patients decreased compared with healthy individuals, which was consistent with the results of a study by Huang et al.recent studies have shown that total plasma capacity antioxidant levels vary under different conditions[23, 24]. Therefore, the status of plasma antioxidants will vary depending on which antioxidants are evaluated [25, 26].

CONCLUSIONS

Our research results show significant changes in Enzymatic antioxidants and MDA in patients with malignant tumors also showed in benign patients Therefore, it is possible to determine the activity of antioxidant enzymes and

circulating MDA levels As a marker, which may be detected and tracked Patients with breast tumors Also, taking antioxidants can be helpful in preventing breast disease.It may also suggest that increased oxidative stress in patients with breast cancer may also be due to changes in trace elements in these patients. So, to clarify the real MDA,TAC relationship with patients, further studies on a larger scale is required.

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Conflict of interest

All authors declare no conflict of interest in this study.

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