Total Antioxidant Status in Men with Bladder Cancer

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ABSTRACT

Background and objectives: Extensive research and several experimental and practical works have elucidated the relation of oxidative stress markers and the reacting oxygen spaces (ROS) upon the inception and advancement of urinary bladder neoplasm.

Purpose of the study: To estimate the total antioxidant status, and oxidative stress (OS) in recently diagnosed patients with bladder cancer prior to surgical intervention.

Methods: In a case-control study, 24 patients recently diagnosed with urinary bladder cancer, prior to surgical intervention, and another 24 obviously healthful individuals, age correspondent as the patients, behold as a controlling series, participate in the study. Total antioxidant capacity (TAOC) and Malondyaldehyde (MDA), were calculated in both series.

Results: The TAOC level of the patient's group (6.43±1.6) was considerably lower than that of the healthy group (11.2±20). MDA values of the patient's group (9.6±1.7 nmol/l) were considerably more than that of the healthy series (3.1±0.91nmol/l).

Conclusion: The actual work elucidated that bladder cancer patients have lower values of TAOC, and higher values of MDA in comparison with control series. This result may give a new insight into the fact that antioxidant therapy may have value in the management of bladder cancer.

Keywords: bladder cancer, Oxidative stress, Antioxidants.

Introduction

Urinary bladder cancers (BCs) are recurrent neoplasms of the urinary system and, represent 3–5% of all deceases caused by cancers (1), and are the 10th most frequent malignancy overall (2). The prevalence of BC is very high, 1% of males and 0.25% of females will have bladder neoplasm at any period of survival. In the West, the bladder neoplasm is the 4th frequent cancer in males and 9th in females (3,4). The most strongly risk factors are tobacco use, accounting for 50% of cases, followed by professional, environmental exposure, chronic infections, calculi, radiation of the pelvis, and cytotoxic drugs (5–7(. It is usually a disease of aged patients since old patients have increased oxidative stress and are vulnerable to oxidative stress damage (7).

In spite, that knowledge around the BC aetiology is not complete, and multifactorial, some studies suggest that the reacting oxygen types incriminated in the production, advancement and formation of different types of cancer (8-10), in addition, ROS/and reactive nitrogen species are identified as molecules particularly contribute not only in carcinogenesis but also in invasion processes (9,11,12). The epidemiological research revealed that the reduction in the actions of antioxidants is combined with an enhanced hazard of carcinogenesis (13). Disturbances in the equilibrium of antioxidants and oxidative molecules or substances result in a state of oxidative stress, that causes oxidation of plasma lipids, proteins, and DNA, and provokes tissue injury intermediated by the reactive species. Damaging DNA by oxidative stress causes increasing in mutation and oncogenic transformation resulting in tumour development (14). These disturbances can also result in the formation and advancement of cancer by affecting cell functions like cell proliferation, cell remodelling, ageing and cell death (15, 16).

The previous works revealed that the reduction in the functions of antioxidants is combined with an enhanced risk of neoplasm formation. Enzymatic and non-enzymatic antioxidants can inhibit cancer formation by scavenging or preventing SOR formation which causes cancer (17). It has been demonstrated that antioxidants suppress both the development and progression of carcinogenesis, protecting cells from the extravagant formation of reacting oxygen types and reacting nitrogen types, and stopping the collection of peroxide products in bladder tissue (18). The scope of this work is to assess the total antioxidant status and oxidative stress in men with urinary bladder neoplasm.

SUBJECTS AND METHODS

The current study was a case-control, done after obtaining approval from the ethical committee of research in the College of Medicine, University of Nineveh. Aucourant endorsement was acquired from all entrants before being recruited in the project and carried out on 24 newly diagnosed bladder cancer patients with an age range between (50-55 years), who attended the urological clinics in Mosul city- Iraq, during the period of November 2023 till April 2024. Diagnosed on the basis of clinical manifestations, and with imaging by enhanced contrast computerized scan prior to endoscopic examination, the diagnosis was confirmed by histopathological study. Twenty-four apparently healthy individuals matched for age with the patient's group, were enrolled in the study as a control group. None of the participants received vitamins

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or antioxidant supplements or had acute or chronic diseases, rather than BC. Biochemical analysis of TAOC, and serum MDA, were measured using Colorimetric Assay Kit Elabscience®(19,20).

Statistical analysis: Data is set as mean and standard deviation. Using the Excel 2016 data spreadsheet, the t-test was measured and $p<0.05$ was beheld significant.

RESULTS

Male patients with BC (n=24) and controls (n=24) age-matched were entered into the study. Table (1) shows the mean age of the patients versus controls (50.7±7.1), (50.37±6.3) (years (, correspondingly. No statistically considerable variation in age ($p>0.05$) existed.

Table 1. The age of the studied groups.

Parameter	Patients (n= 24)	Control (n=24)
Age (in years)	50.70±7.10	50.37±6.30

Table 2 shows the differences in antioxidant/oxidant parameters. TAOC plasma concentration of the patient group was considerably lower than the healthy group (6.43±1.6, and11.2±20U/ml) respectively ($p<0.05$). Conversely, the MDA plasma concentration of the patient group (9.6±1.7 nmol/ml) was considerably higher than the control group (3.1±0.91nmol/ml) ($p<0.001$) (Figure 1 and Figure 2).

Table 2. The serum value of TOAC of patients and control groups.

Parameter	Patients (n= 24)	Control (n=24)
TAOC(U/ml)	6.43±1.6	11.2±20
MDA(nmol/ml)	9.6±1.7	3.1±0.91

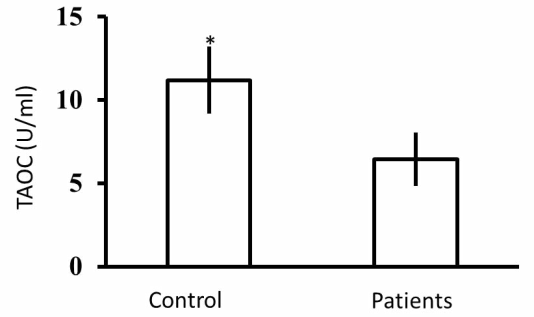

Figure 1. The level of TAOC (U/ml) in both control and patients. Data expressed as mean±SD (n=24). *significant difference between patient and control group using 2-sample T-test.

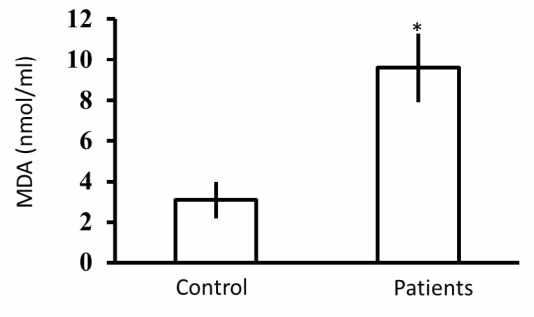

Figure 2. The level of MDA (nmol/ml) in both control and patients. Data expressed as mean±SD (n=24). *significant difference between patient and control group using the 2-sample test.

DISCUSSION

Several researches have demonstrated that oxidative stress has a crucial part in the pathogenesis and development of neoplasms. Oxidative stress is depicted by an unbalanced inter alia enhanced tissue exposition to reacting oxygen radicals and antioxidant protection, lack of this equilibrium causes injury in the structure of the cells, genetic transformation, and deviation, or inhibition of neoplasm oppressor genes, which finally provokes cancerogenesis (21).

Therefore the actual work was designed to evaluate antioxidant activity in recently diagnosed patients with bladder cancer prior to surgery, by measuring plasma levels of the plasma antioxidant capacity (TAOC). And oxidative stress by measurement. Malondialdehyde (MDA).

The actual work included 24 newly diagnosed patients and 24 obviously healthy kept as a control group. The groups corresponded regarding age as assured by the lack of considerable variations between the series. The corresponding may eliminate any impact of this parameter on the results of the work. The exclusion of the age influence on the results of clinical studies was done in the majority of other studies dealing with the oxidation domain.

Concerning the evaluation of TAOC, which is more favourable than the assessment of separate antioxidant substances, it gives a more exact marker of the relation between antioxidant status and disease (22). The actual work shows a considerable reduction of TAOC levels in patients in comparison with control (6.43±1.6; 11.2±20 U/ml), and a considerable elevation in serum level of MDA in the patients group as compared to control (9.6±1.7; 3.1±0.91nmol/ml) correspondingly.

Our results were supported by the former works, which revealed a significant remarkable depletion in the values of antioxidants, and an increase in the values of oxidants in both serum and bladder tissue of experimental and diseased bladder cancer in comparison with the healthy individuals (16,23,26-28). Research done by Mazdak *et al.,* (23), found that TAOC was decreased in BC patients, in comparison with healthy individuals. Other studies assessed the activity of individual antioxidant enzymes. Cobanoglu *et al.,(*16); and Korotkina *et al.,* (26), have demonstrated that superoxide dismutase and catalase functions in many kinds of BC cancers, are considerably less in comparison with control, and catalase levels are lower in patients with advanced types. Utanğaç *et al.,* (27), assessed the antioxidant enzymes paraoxinase and arylesterase and revealed them to be less in patients rather than in the healthy group.

Zainal *et al.,* (28) evaluated catalase activity in erythrocytes, they found lower levels in patients with BC in comparison with control. This decrease in catalase function may be elucidated by the exagerated formation of unstable radicals and exhaustion of catalase for their elimination. Gunes et al.,(8) measured other antioxidant enzymes (glutathione-s-transferase, reduced glutathione, superoxide dismutase and glutathione reductase) in the serum of patients with BC, and xanthine oxidase which is an oxidative marker, their study revealed a considerable statistically lower of antioxidants enzymes, and higher of xanthine oxidase, than the control, indicates that oxidative stress interferes with the etiopathogenesis of bladder tumour.

In a study done by Gecit et al.,(29) on the bladder tissue, the values of antioxidants (glutathione peroxidase, superoxide dismutase, glutathione-s-transferase) showed a statistically considerable less in the urinary bladder tissues of patients with bladder cancer. Indeed, oxidants (malondialdehyde and prolidase) in the BC tissue were statistically significantly increased.

The researchers also explained that depletion in superoxide dismutase and catalase functions could be caused by tumour advancement, and keeping the activity of enzymes may become a crucial method to avoid or manage cancer.

MDA is the last production of polyunsaturated lipid acid oxidation which is commonly applied as a designation for the lipid peroxidation levels and for the existence of oxidative stress that may result in antioxidant depletion. Sawicka *et al*., (20); Wigner *et al*., (25), found that MDA level was even 3 times more in serum samples of patients with bladder cancer, in comparison with control groups. In addition, Galiniak et al**.,** (24)**;** Sawicka et al, (20)**,** investigated also advanced oxidized protein products (AOPP), an indicator of protein oxidation in serum and urinary samples of BC patients. They found statistically considerable elevation in both samples of patients with BC in comparison with healthy individuals.

The reproduction of tumour cells results in an increase in the formation of ROS caused by increased metabolic request and modification of antioxidant guard systems (30). In the initial steps of cancer formation, exaggerated ROS production can be assigned to increase the reproduction rate of cancer cells, while the O2 request rapidly surpasses what is offered due to a deficit of angiogenesis (31). The end result of a hypoxic tumour environment reduces electron entrance via the electron transport chain, leading to mitochondrial reacting oxygen radicals production (32).

Together, this feedback shows that oxidant/antioxidant scales participate in BC evolution, and advancement, and can be targets for important therapeutic antioxidants drugs. Antioxidants have a crucial role in preventing and blocking tissue oxidation damage.

CONCLUSION

Our results indicate that oxidative stress is involved in the pathogenesis of BC. therefore, the antioxidants are preventive upon BC and will be effective in its management, and antioxidants vitamins such as ascorbic acid) and alpha-tocopherol could be used as an adjunct therapy, and further studies must also needed to use antioxidant therapy in patients with BC.

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Potential Conflict of Interest: None

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