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Serum albumin and its relationship with glutathione levels in patients with brain tumor

Bhavna Nayal[1], BK Manjunatha Goud [2*], CV Raghuveer[1], Jeevan K Shetty[3], Sarsina Devi [4], K Deepa[5], RN Devaki[5].

[1]Department of Pathology, Melaka Manipal Medical College, Manipal University, Manipal, India.
[2]Department of Biochemistry, Melaka Manipal Medical College, Manipal University, Manipal, India.
[3]Department of Biochemistry, Kasturba Medical College, Manipal University, Manipal, India.
[4]Department of Nursing, New City Hospital, Udupi, India
[5]Department of Biochemistry, JSS Medical College, Mysore, India.

ABSTRACT

Present study was carried out to compare the levels of serum albumin and glutathione in patients' with brain tumor and healthy controls and to know the relationship between glutathione and serum albumin.The study was carried out in 30 patients with brain tumor and 30 healthy age matched controls. Glutathione levels were measured spectrophotometrically using Beutler's method. Serum albumin and total protein were estimated using automated analyzer and serum globulin was calculated by subtracting albumin from total protein.There was significant decrease in levels of serum albumin, globulin and glutathione ($p<0.001$) in brain tumor patients compared to healthy controls. On applying Pearson's correlation serum albumin levels correlated positively with glutathione ($p<0.01$, $r = 0.777$).Decreased albumin levels reduce the available protein bound thiols, along with decrease in glutathione levels which may further enhance the oxidative stress in patients with brain tumor.
Keywords: Glutathione, Albumin, Oxidative stress, Brain tumor.

Corresponding author
Email: drmanjunathag@yahoo.co.in

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INTRODUCTION

The term “brain tumor” refers to a collection of neoplasms, each with its own biology, prognosis, and treatment; these tumors are better identified as “intracranial neoplasms,” since some do not arise from brain tissue. However, for most intracranial tumors, the clinical presentation, diagnostic approach, and initial treatment are similar [1]. Metastases to the brain from a systemic primary cancer are even more common; one estimate suggests that more than 100,000 patients per year die with symptomatic intracranial metastases [2]. Free radical production is universal in all respiring organisms and is enhanced by many disease processes, exposure to carcinogens and under conditions of stress [3]. Glutathione is a ubiquitous thiol containing tripeptide which is an important defense against free radicals and hydroperoxides. Glutathione has important function such as storage and transport of cysteine, maintaining the reducing state of proteins and thiols, and protecting the cells from toxic compounds such as reactive oxygen species, drugs or heavy metal ions. In humans glutathione depletion is linked to a number of disease states including cancer, neurodegenerative and cardiovascular disease. [4]

The prevalence of protein calorie malnutrition (PCM) in cancer patients is reportedly high, which can be assessed with the help of anthropometric measurements, immunocompetence and serum albumin estimation and such studies have been shown significance of albumin as a good marker of PCM [5]. Previous studies have shown that kwashiokor type of PCM is seen in cancer patients [6]. Albumin can also be an indicator of oxidative stress because albumin bound thiols are considered as important antioxidants and play a significant role in combating oxidative stress.[7] Present study was done to know the levels of serum albumin and glutathione in patients with brain tumor and to know the relationship between them.

MATERIALS AND METHODS

The study was carried out in 30 patients with brain tumor and 30 healthy age matched controls. Patients were recruited from department of oncology, Kasturba Hospital Manipal. The mean age of patients with brain tumor was 65±7 years and that of healthy controls was 65±8 years. There were 18 males and 12 females in the patient group. The patient with hypertension, diabetes and other cancers were excluded from the study. Informed consent was taken from all subjects involved in the study and was approved by institutional ethics committiee. Venous blood samples were collected from the patients before the initiation of chemotherapy or radiotherapy under strict aseptic precautions and processed accordingly.

Biochemical estimations

Glutathione levels were measured spectrophotometrically using Beutler’s method. [8] Serum albumin levels were measured by bromocresol green dye binding and total protein by Biuret method using automated analyzer (Hitachi 912) and serum globulin was calculated by subtracting albumin from total protein. [9,10]

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Statistical Analysis

The results were expressed as mean ± standard error of mean (SEM). A $p<0.05$ was considered statistically significant. Statistical analysis was performed using the statistical package for social sciences (SPSS-16, Chicago, USA). Independent student't' test was used to compare the mean between the groups. Pearson correlation was applied to correlate between the parameters.

RESULTS

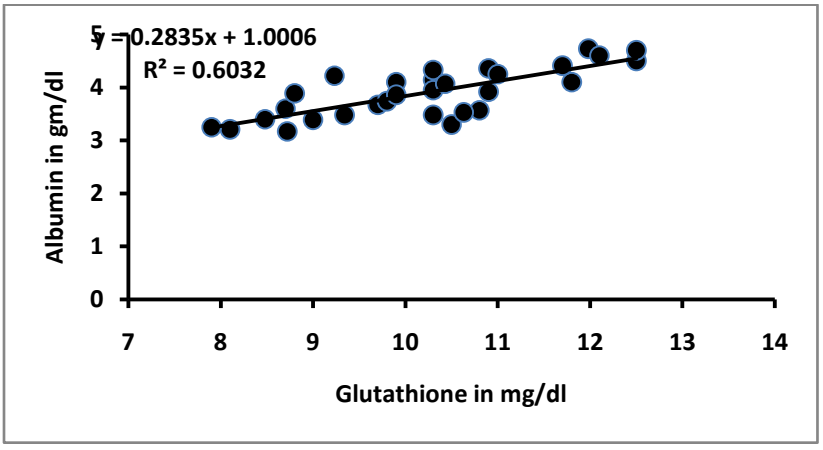
As shown in table 1 there was significant decrease in levels of serum albumin, globulin and glutathione ($p<0.001$) in brain tumor patients compared to healthy controls. As depicted in figure 1, on applying Pearson's correlation serum albumin levels correlated positively with glutathione ($p<0.01$, $r = 0.777$).

Table 1: Serum Albumin and glutathione levels in patients with brain tumor compared to healthy controls. (Values are expressed in mean ± SEM)

	Controls (n=30) Mean ± SD	Cases (n=30) Mean ± SD
Age (years)	65 ± 7	65 ± 8
Sex (M/F)	21/9	18/12
Glutathione (mg/dl)	39.2±9.8	10.21±1.29*
Albumin (g/dl)	4.35±0.58	3.89±0.46*
Globulin (g/dl)	2.54±0.55	2.00±0.44*

* $p < 0.001$, compared to healthy controls.

Figure 1- Graph showing correlation between glutathione and Serum Albumin



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DISCUSSION AND CONCLUSION

In line with previous studies we found significant decrease in serum albumin and globulin levels in patients with brain tumor compared to healthy controls. Serum albumin being an important indicator of nutritional status, contains thiol group at cysteine -34 portions in its structure. Albumin bound thiols are considered as major antioxidants in the physiological system protecting against oxidative damage.[11] Decreased serum albumin level in patients with brain tumor reflects nutritional status and also suggests reduced levels of available thiol group which predisposes oxidative damage in patients with brain tumor.[3,5] Previous studies have indicated the role of oxidative stress in pathogenesis of cancer including brain tumor.[1] Schwartzbaam *et al* suggested the role of serum albumin in predicting the outcome after surgery in patients with brain tumor, which may be due to protection rendered by albumin itself and also bound thiols.[12]

We found decreased glutathione levels in patients with brain tumor. Glutathione has got important role in neutralizing free radical and maintenance of protein bound thiols [13]. According to previous studies low glutathione levels can predispose for development of neurogenerative disorders, cancer including brain tumor. [14] Glutathione and other antioxidants have been shown to protect against mutagenesis and also delay in apoptosis stimulated by various signals. Efflux of glutathione from the cell stimulates apoptosis providing antioxidants extracellularly, and possibly stimulates phagocytic cells to engulf the apoptotic cells. These mechanisms play a vital role in prevention of mutagenesis in patients with brain tumor. [15]

On applying Pearson's correlation we found positive correlation between serum albumin and plasma glutathione. This suggests the positive association between the glutathione and albumin bound thiols. Glutathione has important role in maintaining thiol group in albumin and low glutathione levels in turn decreases the levels of available albumin bound thiols which will predisposes for generation of reactive oxygen species in patients with brain tumor.[3]

In conclusion, decreased albumin levels reduces the available protein bound thiols, along with decrease in glutathione levels which may further enhances the oxidative stress in patients with brain tumor.

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