ORIGINAL RESEARCH

Association of Depression With Selenium Deficiency and Nutritional Markers in the Patients with End-Stage Renal Disease on Hemodialysis

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Objective: Depression is considered as the most common psychological problem in hemodialysis (HD) patients. As there is little evidence regarding the association of depression with serum selenium level as an antioxidant in these patients, the current survey investigates the possible relationship between depression and nutritional status including serum selenium levels.

Design: Cross-sectional study.

Setting and Subjects: A total of 110 HD patients and 40 healthy controls were enrolled in the study. The patients were in the age range of 18 to 85 years, who had been on hemodialysis for at least 3 months without any acute illness.

Main Outcome Measure: Beck Depression Inventory was used for assessing the severity of depression. Malnutrition was evaluated through subjective global assessment (SGA) and malnutrition inflammation score (MIS). Serum selenium levels and routine laboratory markers were measured from fasting samples.

Results: Sixty-two percent of the patients had some degree of depression based on Beck Depression Inventory score. HD patients were considered to be selenium deficient after comparing the mean value of serum selenium between the patients and controls ($P < .001$). No significant difference was found in serum selenium levels between depressed HD patients and the rest of patients without depression. The mean level of SGA and MIS in the depressed patients was significantly higher than the rest of patients ($P = .03$ and $P = .04$, respectively). Also lower levels of hemoglobin and serum albumin were significantly seen in depressed patients compared with nondepressed ones ($P = .004$ and $P = .04$, respectively).

Conclusions: Although the HD patients in this study were selenium deficient, no significant association was found between depression and selenium. In addition, depression was more prevalent in malnourished HD patients with higher SGA and MIS scores and lower serum albumin and hemoglobin levels.

Introduction

DEPRESSION IS THE most common psychological problem in the end-stage renal disease (ESRD) patients undergoing hemodialysis (HD).[1,2] HD affects the life of patients in different aspects of social, physical, occupational, and personal. Thus, depression may be a normal response to these situations in HD patients.[3] A mutual link has been found between depression and chronic disease state in the way that depression could have a great impact on nutrition, appetite, and immune system.[1,4] It has been demonstrated that depression is an important predictor of morbidity,[5] mortality,[6–10] and lower quality of life[11] in patients undergoing HD. Depression as an inflammatory disease characterized by accumulation of highly reactive oxygen species[12,13] is associated with an increased risk of cardiovascular disease and atherosclerosis.[14] Selenium as an essential antioxidant has a modulatory role in brain function and mood stabilization through attenuation of inflammation.[12,13,15,16] Previous studies have demonstrated that serum levels of selenium are decreased in HD patients because of insufficient dietary intake or losses through HD membranes.[17] Depression is also linked with malnutrition in the way that it is more severe in depressed dialysis patients.[18] Despite the high prevalence and importance of depression in HD population, many patients often go unnoticed by the health care professionals.[3] The Beck's Depression Inventory (BDI) is a standard self-administered questionnaire for screening HD patients with depression.[1,2] Although there is a large body of literature on depression in chronic kidney disease (CKD), no study evaluated the association of depression with selenium level, nutritional and biochemical markers in HD patients. In addition, a few studies examining the relationship between selenium and depression in healthy population[12,15] have yielded inconsistent results, and none of these studies considered the association of selenium with depression in HD patients. The aim of this study was to elucidate the possible relationship between depression and serum

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Financial Disclosure: See Acknowledgments on page XXX.

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1051-2276/$36.00

http://dx.doi.org/10.1053/j.jrn.2014.12.005

selenium and nutritional and biochemical parameters in a group of patients undergoing HD.

Methods

Patient Selection

The present study included 110 patients with ESRD on HD from the outpatient clinics of our hospital. Forty healthy control subjects without any endocrine or metabolic disease were also recruited from hospital personnel with the aim of comparing depression score and serum selenium levels between healthy population and HD patients. The data were collected from August 1 to December1, 2013. All the participants gave their informed consent in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines. The patients were in the age range of 18 to 85 years, who had been on HD for at least 3 months without any acute illness. All enrolled patients were on HD 3 to 3 times a week for 3 hours using low flux dialysis filters with polysulfone/polyamide membranes and reverse osmosis purified water and bicarbonate-containing dialysis solution. The subjects who took antidepressants, oral iron, vitamin B12, folate, and antioxidant supplements were excluded from the study.

Clinical and Nutritional Assessment

Demographic data (age, gender, level of education, marital status, employment, and duration of HD) were collected through questionnaires filled by the main investigator. The BDI scoring system[1,2,19,20] was used to evaluate the severity of depression in HD patients. The BDI is a standard 21-question multiple choice questionnaire with a self-report inventory which measures the common clinical symptoms of depression like feelings of hopelessness, sadness, anhedonia, guilt, fatigue, and also changes in sleep, weight, appetite, and libido. The value of each component ranges from 0 to 3. At the end, the sum of scores was as follows: 0 to 9: no depression; 10 to 13: borderline; 14 to 19: mild depression; 20 to 28: moderate depression; and 29 to 63: severe depression. Higher scores were indicative of more severe depression. The questions were read and replied by each patient, and the total score was compared with a key to decide whether the patient was categorized as depressed or not. BDI questionnaire was filled for both groups of HD patients and healthy control subjects.

Valid nutritional markers such as subjective global assessment (SGA) and malnutrition inflammation score (MIS) were checked in all patients through face-to-face interview. SGA questionnaire was a useful tool for evaluating nutritional status in HD patients. It includes questions on physical examination (muscle and subcutaneous fat wasting, edema), and nutritional history (weight change during the preceding 2 weeks and 6 months, appetite, food intake, and gastrointestinal symptoms). The overall status was interpreted based on the sum of scores as follows (the score for each item from 0 to 5): a score of less than 10 well-nourished, 10 to 17 mildly to moderately malnourished, and higher than 17 severely malnourished.[21]

MIS scoring system is more quantitative and complete than SGA. It had all the similar parts explained earlier in SGA. It also included 2 nutritional laboratory markers (albumin and transferrin). Each item scores from 0 to 3. The sum of scores of all 10 components could be a good indicator of nutritional status. The higher the score was, the more severe the malnutrition and inflammation was.[22]

Serum selenium levels were measured in both groups of healthy controls and HD patients from fasting serum samples using graphite furnace atomic absorption spectrometry method.[23] The blood samples were taken from the patient's arm used for HD cannulae just before the beginning of the HD session. The serum in both groups of healthy and HD patients was obtained by centrifugation at 3000 g/minute for 5 minutes and stored at −70°C in the laboratory of the local hospital for further analysis. Other routine laboratory markers (as listed in Table 3) such as blood urea nitrogen, creatinine, albumin, hemoglobin (Hb), serum iron, ferritin, and lipid profile were assessed for each patient using standard automated techniques in facilities.

Selenium Measurement Settings

The wavelength used was 196.0 nm with slit width 1.0 nm and lamp current: 10.0 mA. Calibration mode was standard additions. Adding inorganic selenium to sera before sample reduction yielded valid calibration slopes by standard additions. The final furnace conditions and temperature program for drying of serum for selenium detection are depicted in Table 1.

Statistical Analysis

Data were analyzed using SPSS 18 (SPSS Inc., Chicago, IL) statistical software package. All the data were assessed for normality of distribution, using the Kolmogorov–Smirnov test. Depression score in 2 groups of HD patients and healthy controls with regard to confounding factors (age, sex, marriage, job, education level) were compared using covariance analysis. To compare variables according to the Beck depression score among HD patients,

Table 1. Standard Addition Steps in Measuring Serum Selenium Levels

Step Number	Temp Degree (C)	Time (s)	Gas Flow (L/min)	Gas Type	Read	Store
1	85	5.0	3.0	Normal	No	No
2	95	40.0	3.0	Normal	No	No
3	120	10.0	3.0	Normal	No	No
4	400	5.0	3.0	Normal	No	No
5	1,000	1.0	3.0	Normal	No	No
6	1,000	2.0	0.0	Normal	No	Yes
7	2,600	0.8	0.0	Normal	Yes	Yes
8	2,600	2.0	0.0	Normal	Yes	Yes
9	2,600	2.0	3.0	Normal	No	Yes