Influence of Selected Biomarkers on Stress and Alexithymia in Patients under Hemodialysis Treatment

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Abstract
Background: Chronic renal failure causes a number of physical problems in patients. Hemodialysis treatment and the stress brought along by the treatment are high and this circumstance sets the ground for alexithymia. Alexithymic feelings basically emerge as restriction in the world of emotion and thought, and inability to recognize physiological changes. Biomarkers that are indicators of physical change are influential in the stress lives of individuals. They lead to negative changes in the physical and mental lives of patients who have chronic kidney failure and individuals who receive hemodialysis treatment. This research was carried out as a relationship seeker in order to determine the influence of urea, creatinin, sodium, potassium, hemoglobin, hematocrit, albumin, calcium, phosphorus and C-reactive protein biomarkers on stress and alexithymia in individuals, who are diagnosed with chronic renal failure and receive hemodialysis treatment. Methods: The research environment was formed of patients who underwent hemodialysis treatment in a hospital in Turkey. The subject group was completed of 72 individuals. Demographic data form, biochemical data form, Hemodialysis Stressor Scale and Toronto Alexithymia Scale were used in the research. Results: It was found that the levels of perceived stress of individuals who participated in the research were high at all dimensions, and 59.7% were alexithymic. The means of the total scale scores of all patients were calculated as 87.81±13.59 for HSS and 62.46±9.84 for TAS. The relationship between TAS-20 and HSS and selected biomarkers were determined (p<0.05). Conclusion: It was concluded that stress and alexithymic feelings were high in patients who received hemodialysis treatment. It was concluded that there is a relationship between C-reactive protein, creatinin, sodium, hemoglobin, hematocrit, potassium from the biomarkers and the scales and scale sub-dimensions. It is necessary to increase the awareness of nurses on the importance of the skills to communicate with individuals who have to cope with stress, manage emotions, and have high stress and emotional deprivation.

Background
While chronic renal failure (CRF) causes many physical problems in patients, sick individuals are also psychologically and socially influenced by hemodialysis (HD) treatment and the feeling of being dependent on a mechanical instrument brought along by the treatment. CRF patients under HD
treatment constitute a specific group due to changes not only in their health but also in their other social environments [1, 2]. HD treatment gives rise to basic fluid electrolyte imbalances [3]. The stress levels in such patients rise due to physical and psychological problems that emerge during the uremic period, sudden changes in biomarkers, medication treatment, diet treatment and HD treatment [2, 4]. And when the increased stress becomes continuous, it sets the ground for alexithymia in direct proportion with the disease [5].

Alexithymia is defined as restriction in imagination, fantasy life; inadequacy to distinguish between emotions, thoughts and physiological reactions and problems in recognizing and expressing emotions [6]. Alexithymic behavior patterns observed in patients have been defined as: nervousness, short temerredness, touchiness, introversion, loss of interest and desire, loss of hope aimed for the future, distress, anxiety and emotional deprivation as a result of these [5, 7]. Feelings such as fear, anger, sorrow of alexithymic individuals lose their persuasive properties and may cause individuals to mask their emotions in some way [8]. It is observed that alexithymia studies in the literature are primarily concentrated on the psychiatric diseases group [9]. As a result of our researches, we found out that alexithymia can be observed in individuals who have chronic diseases, even if it has not been identified in the conducted researches [10, 11]. Senturk et al. (2000) reported that CRF patients who received HD treatment had an intermediate level of depression, while more than half of them were alexithymic [5]. In their research, Pop-Jordanova and Polenakovic (2014) determined that half of the patients who received HD treatment were alexithymic, irrespective of sex, and the comparison they made with healthy individuals and cancer patients emphasized that alexithymia was higher in patients who received HD treatment as compared to the other groups [12]. In their research, Kojima et al. (2007) concluded that HD patients were prone to depression and were alexithymic [13].

Nursing care includes the planning and implementation of appropriate attempts aimed to relieve the patient, the welfare of life from the biological, psychosocial and socio-cultural perspective, and realizing the ability of the individual to cope with stress factors or the problems that develop as a result of the stressors [14]. It is not appropriate to handle the symptom management or the psychosocial dimension of CRF solely in the nursing approach [15]. Therefore, a nurse has to adopt a
holistic approach while performing care activities during CRF and HD treatment.

In this research, which was not initially designed as experimental, we envisaged to obtain evidence that physical findings obtained from tangible data may be related with alexithymia that is a psychological phenomenon. As the main idea underlying the research design, we thought that biomarkers that changed biochemically in the blood and serum in chronic kidney failures could be recorded as tangible data and the physical change that occurred in the body could be related with alexithymia that is a structured scale and stress. Thus, the alexithymia and stress table of hemodialysis patients could be discovered in proportion with the pre-treatment and post-treatment changes in their biomarkers. We believed that our study could assist nurses who work as care providers for CRF patients receiving HD treatment, in providing holistic care by evaluating the relationship of the biomarkers with the stress levels and alexithymia of the patients and develop a guide as aimed for such patients. Accordingly, the research was conducted in order to evaluate the relationship between the selected biomarkers of patients who receive HD treatment with stress and alexithymia.

Methods

2.1. Study design

The prospective cross-sectional demographic data of our study designed to assess the relationship between biomarkers, hemodialysis stressors and alexithymia.

2.2. Participants

Our study was conducted in a hospital hemodialysis unit in Turkey, and data was collected until the repeated measurements. The sample was completed with 72 HD patients.

The inclusion criteria were;
Taking HD treatment for six months or over due to CRF diagnosis.
Eighteen years of age or older, reading the informed consent form and agreeing to participate in the work.
Being literate.

The exclusion criteria were:
To have psychiatric diagnosis, tumor and metastasis,
Taking HD treatment except for the diagnosis of CRF,
Undergoing HD treatment with a diagnosis of CRF for less than 6 months,
Not to be able to speak Turkish.

2.3. Measures and instruments

2.3.1. Patients’ demographic characteristics

The data collection form as prepared by the researcher in relation to the HD treatment to determine the patients’ demographic data was used in this research. This form included 11 questions, including patients’ socio-demographic data, how many medications they took, HD acquisition time, age, gender, additional chronic disease status, education status, marital status, income level, occupation and working status.

2.3.2. Biomarker list

A list of biomarkers was used to collect biomarkers. Urea, creatinine, hemogram, hematocrit, albumin, sodium, potassium, C reactive protein (CRP) values were noted in the list.

2.3.3. Hemodialysis stressor scale (HSS)

Hemodialysis Stressor Scale was used to determine stress. The scale was developed by Baldree et al. and was adapted to Turkish society by Kara [14]. The HSS is a five-point Likert-type scale and is coded as “always” 5, “often” 4, “sometimes” 3, “rarely” 2 and “never” 1. HSS has been identified in HD patients as physical (HSS-1) and psychosocial stressors (HSS-2) [16]. The physical hemodialysis stressor score is 6–30 and the psychosocial hemodialysis stressor score is 23–115 points. The total score of HSS varies in 29–145 points. The total HSS score ranges 29–145 and increasing the score on the scale indicates that the perceived stress level is higher [16].

2.3.4. Toronto alexithymia scale (TAS-20)

The Toronto Alexithymia Scale was used to measure alexithymia. A self-report scale consisting of 20 items evaluating alexithymia, with a score of 1–5, likert-type and three subscales. These sub-dimensions are difficulty identifying feelings (TAS-1), difficulty expressing emotions (TAS-2) and outward-thinking (TAS-3). Individuals are asked to mark the most appropriate score for each item from "Never", "Rarely", "Sometimes", "Often" and "Always". This scale was developed by Bagby et al. (1994) and Turkish adaptation was done by Gulec et al. (2009). Items 4, 5, 10, 18 and 19 on the scale are scored in reverse [17]; the cut-off value of TAS-20 is 51 and less, with 52–60 indicating possible
alexithymia and a score >61 indicating alexithymia [18].

2.4. Data collection and procedure

This research was carried out between 03.08.2016 and 04.04.2017. The single measurement biochemical values of the participants who participated in the study planning were examined. The biochemical values were measured immediately before taking hemodialysis treatment and evaluations were done in this direction. Verbal information was given prior to the application, confirmed by filling informed consent forms, and approved on the basis of volunteerism. The questionnaire forms were applied face-to-face by the researcher and coded with patient initials and prochol numbers in order to prevent repeated questionnaires.

2.5. Analysis

The distribution of continuous variables such as age, albumin, and CRP in the study were examined by Shapiro–Wilk test and normality graphs. All continuous measurements were expressed as mean ± standard deviation (mean ± s), the number of drugs used daily was median (min-max), and categorical variables were expressed as number (n) and percentage (%). The consistency of responses to HSS and TAS-20 was assessed with Cronbach’s α. Subgroups of HSS, TAS-20, and scales were tested by Mann–Whitney U test and independent sample tests according to gender and additional chronic illness status, Kruskal–Wallis test, and one-way ANOVA according to marital status and hemodialysis time. Relationships between scale scores, biomarkers, and the number of drugs used daily were examined by Pearson or Spearman Correlation analyses depending on the distribution of variables. The statistical significance level was accepted as p<0.05. The Cronbach’s α value of HSS in our study was 0.789 and the Cronbach’s α value for TAS-20 was measured as 0.737. Accordingly, the consistency of responses to the scale was acceptable (0.70<α<0.80).

2.6. Limitations

Single center was studied. The number of sessions was not examined as variable. A single measurement was used before HD. These conditions were determined as limitations of the study.

Results
The following findings were obtained in the data obtained from our study. When the alexithymia levels of subjects participating in the study were examined, it was found that 59.7% (n=43) were alexithymic (Table 1).

| Table 1. Percentage distributions according to alexithymia levels of hemodialysis patients |
|--------------------------------------------------------|-----------------|-----------------|
| Sample (n) | Percent (%) |
| No alexithymia (51 points and below) | 10 | 13.9 |
| Possible alexithymia (52-60 points) | 19 | 26.4 |
| Alexithymia (61 points and above) | 43 | 59.7 |

55.6% (n=40) of the individuals included in our study were men, 66.7% (n=48) were married, and 63.9% (n=46) had additional chronic diseases. Hemodialysis durations were 30.6% (n=22) for six months to two years, 27.7% (n=20) for 2–5 years, 15.3% (n=10) for 5-8 years, 8.3% (n=6) for 8–10 years, and 18.1% (n=13) for >10 years. (Table 2). The relationship between the subscales of demographic data, HSS, HSS subscales, TAS-20, and TAS-20 subscales was evaluated in Table 2. Additional chronic disease and the HSS-1 subscale were statistically significant.

| Table 2. Demographic data rates of individuals who received hemodialysis treatment, evaluation of demographic data with HSS, HSS subscales, TAS-20, TAS-20 subscales | Sample (n) | Percent (%) |
|-----------------------------------------------------------------|-----------------|-----------------|
| No alexithymia (51 points and below) | 10 | 13.9 |
| Possible alexithymia (52-60 points) | 19 | 26.4 |
| Alexithymia (61 points and above) | 43 | 59.7 |
| Characteristics       | Categories | n (%) | HSS \(\bar{x} \pm SD\) | HSS-1 \(\bar{x} \pm SD\) | HSS-2 \(\bar{x} \pm SD\) | TAS \(\bar{x} \pm SD\) | TAS-1 \(\bar{x} \pm SD\) | TAS-2 \(\bar{x} \pm SD\) | TAS-3 \(\bar{x} \pm SD\) |
|----------------------|------------|-------|-------------------------|---------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                      |            |       | Z(t)/\chi^2(f); \(p\)   | Z(t)/\chi^2(f); \(p\)    | Z(t)/\chi^2(f); \(p\)  | Z(t)/\chi^2(f); \(p\)  | Z(t)/\chi^2(f); \(p\)  | Z(t)/\chi^2(f); \(p\)  | Z(t)/\chi^2(f); \(p\)  |
| Gender               | Female     | 32 (44.4) | 88.94± 10.86 | 19.03± 3.93 | 69.91± 9.99 | 62.19± 9.49 | 20.34± 3.93 | 14.81± 3.30 | 14.62± 3.05 | 27.03± 4.95 |
|                      | Male       | 40 (55.6) | 86.90± 15.52 | 17.47± 4.21 | 69.42± 13.50 | 62.67± 10.22 | 20.35± 4.71 | 14.62± 4.05 | 27.70± 4.55 |                      |
|                      |            | 0.578; 0.661 | 1.606; 0.113 | 0.168; 0.867 | 0.208; 0.836 | 0.473; 0.636 | 0.212; 0.833 | 0.545; 0.586 |                      |                      |
| Marital status       | Married    | 48 (66.7) | 88.21± 14.81 | 18.40± 4.17 | 69.81± 13.21 | 60.73± 9.08 | 20.00± 4.64 | 14.19± 3.56 | 26.54± 4.55 |
|                      | Single     | 14 (19.4) | 87.93± 11.51 | 18.29± 4.08 | 69.64± 9.52 | 64.29± 11.34 | 20.64± 3.52 | 15.07± 4.06 | 28.57± 5.32 |
|                      | Divorced   | 10 (13.9) | 85.70± 10.71 | 16.90± 4.22 | 68.80± 9.51 | 68.20± 4.09 | 21.60± 4.09 | 16.70± 3.53 | 29.90± 3.60 |
|                      |            | 0.828; 0.661 | 0.732; 0.694 | 0.029; 0.972 | 2.824; 0.066 | 2.795; 0.247 | 2.040; 0.138 | 5.870; 0.053 |                      |                      |
| Chronic disease      | Yes        | 46 (63.9) | 88.67± 11.32 | 19.33± 3.52 | 69.35± 10.35 | 64.15± 8.78 | 21.04± 4.11 | 14.93± 3.60 | 28.17± 4.44 |
|                      | No         | 26 (26.1) | 86.27± 17.04 | 11.12± 4.39 | 70.15± 14.66 | 59.46± 11.02 | 19.12± 4.56 | 14.81± 3.94 | 26.04± 4.94 |
|                      |            | 0.205; 0.837 | 3.394; 0.001 | 0.272; 0.786 | 1.983; 0.051 | 1.325; 0.185 | 0.686; 0.495 | 1.651; 0.099 |                      |
| Duration of dialysis | 6month-2year | 22 (30.6) | 89.64± 18.96 | 18.41± 4.74 | 71.23± 16.43 | 62.45± 11.38 | 21.27± 5.70 | 14.45± 4.28 | 26.73± 4.94 |
|                      | 2-5 year   | 20 (27.7) | 88.85± 10.83 | 19.05± 3.24 | 69.80± 9.79 | 63.50± 7.82 | 20.00± 3.91 | 15.10± 3.14 | 28.40± 3.63 |
|                      | 5-8 year   | 11 (15.3) | 82.18± 8.64 | 16.27± 3.32 | 65.91± 8.38 | 61.45± 10.44 | 20.00± 3.03 | 14.18± 3.34 | 27.27± 5.98 |
|                      | 8-10 year  | 6 (8.3) | 83.50± 3.94 | 15.67± 4.41 | 67.83± 6.49 | 65.17± 9.66 | 21.67± 2.34 | 15.50± 4.23 | 28.00± 4.60 |
|                      | 10year &more | 13 (18.1) | 89.85± 12.61 | 19.15± 4.36 | 70.69± 11.41 | 60.46± 10.42 | 19.00± 4.04 | 14.62± 3.99 | 26.85± 5.10 |
|                      |            | 6.844; 0.144 | 6.544; 0.162 | 2.343; 0.673 | 0.320; 0.864 | 3.847; 0.427 | 0.872; 0.929 | 1.239; 0.872 |                      |

The biomarkers of urea, creatinine, hemoglobin, hematocrit, albumin, sodium, potassium, calcium, phosphorus, and C-reactive protein (CRP) values of the subjects who participate in the study were
evaluated. The median number of medications used by the patients on a daily basis was three (min-max: 1–20). Normally deviating values were determined and the relationship between the HSS, HSS subscales, TAS-20, and TAS-20 subscale scores was assessed. A positive correlation was found between the TAS-20 point average and the HSS-1, between the HSS score average and TAS-1, between CRP and HSS, HSS-2 and the number of drugs used daily and HSS-1 in the direction of the obtained results. There was a negative correlation between creatinine and HSS-1, TAS-20, TAS-2, TAS-3, between hemoglobin and TAS-1, between hematocrit and TAS-1, between sodium and HSS-1, between potassium and TAS-3 (Table 3).

Table 3. Assessment of the relationship between biomarkers, total score average of TAS-20, total mean score of HSS and the number of daily medicines used by HSS, HSS subscales, TAS-20, TAS-20 subscales
Discussion

Emotional disorders, time, diet and functional restrictions, self-change and fear of death are quite high for individuals who are under chronic hemodialysis treatment in addition to the exhaustion originating from the disease. Many problems that exist in this patient group were found to be factors in the development of alexithymia. Both the literature and the results of our study suggest that alexithymia is observed at high levels in chronic diseases (Table 1). Pop-Jordanova & Polenakovic reported that half of the patients who received HD treatment in Macedonia (n=230) appeared alexithymic [12]. In a study they conducted, Sinatra et al. (2011) found that the primary psychiatric outlook that accompanied depression was alexithymia in patients under HD treatment for 4 years and
above [19]. As a result of our research, we found that the increase in the length of hemodialysis treatment is in direct proportion with the emergence of alexithymic symptoms.

It was reported that 31.5% of the subjects received HD treatment for nine months and less, 32.5% received treatment between 9 and 24 months, and 36% were under HD treatment for more than 24 months in a research conducted by Davison & Jhangri (2005), while the mean HD treatment period of HD patients was reported as 58.75±48.94 months in a different study [20, 21]. In our research, we determined that 22 patients (30.6%) entered hemodialysis for 6 months-2 years, 20 patients (27.7%) for 2-5 years, 11 patients (15.3%) for 5-8 years, 6 patients (8.3%) for 8-10 years and 13 patients (18.1%) for more than 10 years (Table 2). The exposure of hemodialysis patients to physical and psychological changes that they have to cope with increases in direct proportion with the increase in their treatment periods. This experienced process should be carefully followed up also with respect to the patient and healthcare employees.

Physiological changes such as edema and ultrafiltration during hemodialysis treatment may render the biomarkers of individuals instable. In a study they conducted, Griva et al. found that the hemoglobin value was low in HD treatment [22]. In a systematic compilation, a statistical significance was reported with respect to living quality in health and sub-dimensions in 3 dimensions that examined the CRP value in HD patients [23]. In a study where Kalender et al. evaluated the biomarkers with respect to receiving HD treatment for 3 or 2 sessions per week, they found that the hemoglobin, hematocrit, albumin and calcium values were higher in individuals who received HD treatment in 3 sessions per week, while urea, creatinin, potassium and phosphorus values were higher in individuals who received HD treatment in 2 sessions per week. In conclusion, they found that the treatment adequacy of individuals who received HD treatment for 3 sessions per week was higher as compared to those who received 2 sessions per week [24]. When we examined studies evaluating hemodialysis patients, we observed that biomarkers have multi-dimensional influences on the health of patients. We believed that these parameters increased the HD-origin stress of patients and set the ground for alexithymic outlook.

When we evaluated the variables with HSS and HSS sub-dimensions in our study, we concluded that
there was no relationship between the sex, marital status, hemodialysis period, accompanying chronic disease variables and the mean scores of the scale and scale sub-dimensions (p>0.05). The relationship between the presence of accompanying chronic disease and HSS physical sub-dimension mean scores was found to be statistically significant (t=3.394, p=0.001). In their study, Shahrokhi et al. (2014) reported that there was no statistically significant relationship between the type of the HD dependent stressor, and sex, marital status, educational status, number of weekly HD sessions and HD period [25]. Mok & Tam (2001) reported similar conclusions in their findings [26]. In a similar study, Ahmad & Nazly (2015) reported that there is a negative relationship between coping with stress and seeking social support as the HD period increases. When they examined individuals receiving hemodialysis treatment as based on the sex variable in the same study, they reported that there is a positive relationship between HSS, HSS physical and psychosocial sub-dimensions and the difference in between was statistically significant [27]. Most of the physical stressors include fatigue, fluid restriction, nutrition limitations, dressing difficulties due to arterial and venous catheterization. Meanwhile, most of the psychosocial stressors may be considered as loss of time, place problems, transportation, sleeping disorders, dependence and boredom. At the same time, we may also include changes of roles in the family with respect to children, isolation and transfer problems. It was concluded that these variables are influential on HD-origin stress.

We compared the scores of the patients from the Toronto alexithymia scale and sub-dimensions with sex, marital status, accompanying chronic disease status and periods of entering hemodialysis (Table 2). We determined the TAS-20 mean scores of female patients as 62.19±9.49, and that of the male patients as 62.67±10.22. We determined a similarity in TAS-20 scores as based on sex (t=0.208, p=0.836). When we examined the scores of the TAS-20 sub-dimensions with respect to sex, we determined that the mean scores were similar and concluded that sex is not related with alexithymia (p>0.05). The TAS-20 mean scores and the mean scores of the sub-dimensions were not statistically significant as based on marital status (p>0.05). Pistorio et al. (2017) found that patients who were in the process of kidney transplantation and had physical and somatic complaints exhibited a more alexithymic appearance and the difference in between was statistically significant. In the same study,
they reported that there was no relationship when examined as based on the sex variable [28]. In a study that Pop-Jordanova et al. conducted (2014), they reported that there is linear relationship between age and alexithymia. At the same time, they found that alexithymic appearance was relatively higher in males when evaluated as based on sex. When they examined with factor analysis as based on TAS-20 sub-dimensions, they found that TAS-1 and TAS-2 age and hemodialysis entry period was not significant, while the TAS-3 extroverted thinking sub-dimension was significant [12].

As reported in a study conducted in Japan, individuals under end-stage renal failure were divided into two groups as based on depression scores and their alexithymic appearances were examined. It was reported that the alexithymic appearance was higher in individuals who had high depression scores.

In this study, they reported that there is a negative relationship between period of entering hemodialysis and alexithymic appearance [13]. End-stage renal failure and the physical stress created by the fluid changes during HD treatment lead to psychosomatic complaints and this condition negatively influences the appearance as the treatment period increases. Furthermore, accompanying chronic diseases and other psychiatric appearances, the inability of the individual to distinguish between feelings that is expressed as emotional obtuseness increase the alexithymic appearance. The individual who is in an alexithymic appearance experiences difficulty in managing the treatment processes, and this may at the same time cause his physical condition to get worse.

Correlation analysis was made between the scores that hemodialysis patients received from the HSS and HSS physical, psychosocial sub-dimensions and the biochemistry results and the number of daily medication used (Table 3). In a study, they announced in 2009, Harwood et al. associated the biomarkers of CRF patients directly with their stress and coping strategies and found them to be statistically significant. While hemoglobin and albumin from these parameters were statistically significant, it was reported that urea and creatinine parameters were not influential on stress [29]. Accordingly, the biochemical change of individuals may make it difficult to cope with stress since it influences their fatigue levels. The pre-session biochemical data on hemodialysis patients may provide information also on psychosocial variables, in addition to the individual’s potential physical condition. Nurses should also have knowledge on various blood parameters similar to the dialysis
process. Such evaluation will increase the patient care quality of the nurse and positively influence the patient comfort.

Correlation analysis was made between the scores that hemodialysis patients received from the TAS-20 and sub-dimensions and the biochemistry results and the number of daily medication used and the relationship in between was evaluated (Table 3). Lai et al. (2017) examined the biological indicators and alexithymic appearance in renal failure patients who were grouped as based on treatment modalities, and demonstrated that phosphorus and hemoglobin levels directly influenced psychological condition and there was an inversely proportional relationship. In the same study, they evaluated potassium, calcium, phosphorus and hemoglobin from the biochemical data of the patients and their emotional levels, and found them to be statistically significant [30]. Calia et al. (2015) evaluated the emotional status of patients and alexithymia in their study. They compared the physical parameters they examined with creatinine and blood urea nitrogen levels. There was a statistical significance between alexithymia appearance and physiological parameters. Meanwhile, according to a self-evaluation scale related with negative emotion control, they only found a negative relationship between creatinine and negative emotion control [31].

There may be changes in the patient’s metabolic activities, blood circulation, physiological variables and psychological condition in renal failure. The fluid change in the body leads to stress and fatigue in order to adapt to the sudden changes in the biomarkers, irrespective of the CRF treatment that is used. Emotional status changes. Therefore, it is important for the nurse to evaluate periodically the records of this group of patients, who are followed up on in the clinic and at home, including their biomarkers, and to reflect this onto the care plans. At the same time, reducing stress, increasing harmony, planning the treatment and diet regime and increasing comfort are important indicators in reflecting the quality of nursing care.

Conclusions
While urea, creatinin, phosphorus, CRP values were found to be high, hemoglobin, sodium, albumin and calcium values were found to be low from the selected biomarkers in individuals receiving HD treatment. The stress levels of the patients were high and it was determined that more than half of
the patients had alexithymia. It was determined that there was a relationship between the variable on accompanying chronic disease and the HSS physical sub-dimension. A relationship was determined between HSS and CRP, between HSS physical sub-dimension and TAS-20, creatinin, sodium and number of daily used medication, and between the HSS psychosocial sub-dimension and CRP. It was concluded that there was a relationship between TAS-20 and creatinin, between TAS-1 and HSS, hemoglobin, hematocrit, between TAS-2 and creatinin and between TAS-3 and creatinin and potassium in individuals who received HD treatment. In line with our conclusions, we found evidence of the potential influence of physical health on mental health. A repeated study may be planned with multiple measurements in order to determine the fluctuations and what their influences are. In our study, we evaluated the medication quantities ad not the active ingredients or the generic names of the medications. The evidences we expected while designing our research were determined as a result of the study data.

Abbreviations

CRF: Chronic Renal Failure
HD: Hemodialysis
CRP: C-reactive protein
HSS: Hemodialysis Stressor Scale
HSS-1: Physical stressors
HSS-2: Psychosocial stressors
TAS-20: Toronto Alexithymia Scale
TAS-1: Difficulty identifying feelings
TAS-2: Difficulty expressing emotions
TAS-3: Outward-thinking

Declarations

Ethics approval and consent to participate

The Ethics Committee required for this research was the Ethics Committee of the a university Institute of Humanities and Social Sciences in Turkey (decision number 351 dated 02.08.2016). Afterward, the
institution was granted permission from the Research Hospital ethics committee in Turkey where
the research was conducted and the clinical chiefs were informed (decision number 1181 dated
28.09.2016). Volunteer consent was obtained in writing from the people who participated in the
study. The study is based on voluntary participation.

Consent to publish
The study was not published in another journal or congress.

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Competing interests
There is no conflict of interest between the authors.

Availability of data and materials
The data of the study will be shared if requested.

Authors’ Contributions
Author contributions are as follows and all authors approved the final version for submission.

Identifying, designing, and collecting the main idea of the work-E.T., A.K.,

Writing of the article, Critical revision, Analysis and interpretation of the data-E.T., A.K.,

Interpretation of the data and translation-E.T., A.K.

Critical revision, Analysis and interpretation of the data-E.T.

Writing of the article, Critical revision, Analysis and interpretation of the data-E.T.

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Figures
Figure 1

Distribution of additional chronic diseases in individuals receiving hemodialysis treatment

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