

# Relationship Between Dialysis Adequacy and Depression and Anxiety in Hemodialysis Patients

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## Abstract

**Background:** Chronic kidney disease (CKD) is an irreversible condition that demands hemodialysis treatment until a kidney transplant is carried out. If dialysis is not sufficient, the patient might experience numerous physical and psychological consequences. This study aimed to examine the relationship between depression and anxiety and dialysis adequacy in patients receiving hemodialysis in Birjand, Iran.

**Methods:** In this cross-sectional study, 100 patients undergoing hemodialysis treatment at Shahid Beheshti Hemodialysis Center in Birjand were examined. The state of depression and anxiety in them was evaluated according to the Hospital Anxiety and Depression Scale (HADS), and the adequacy of the patients' dialysis was extracted from their medical records. In this study, scores  $\leq 11$  on the HADS scale were considered healthy. Moreover, dialysis adequacy was calculated with the KT/V formula, and cases  $\geq 1.2$  were considered adequate. Data analysis was performed using SPSS 19 software, independent samples t-test, and Pearson correlation coefficient.

**Results:** The results showed that 18% and 82% of the participants had depression and anxiety, respectively. The patients' depression and anxiety scores did not significantly correlate with the adequacy of dialysis ( $P = 0.82$  and  $P = 0.86$ , respectively). The prevalence of depression and anxiety was not significantly influenced by gender or marriage; however, the results indicated that as patients aged, the prevalence of depression increased ( $P = 0.009$ ) and anxiety decreased ( $P = 0.003$ ).

**Conclusions:** The adequacy of dialysis in patients undergoing hemodialysis treatment remains unaffected by mental disorders, such as anxiety and depression. Age has a significant impact on depression and anxiety levels in patients receiving hemodialysis treatment. To reduce anxiety and depression in younger and older patients, it is recommended to initiate support and educational programs.

**Keywords:** Depression; Anxiety; Dialysis Adequacy; Hemodialysis

## 1. Background

Chronic kidney disease (CKD) is the progressive and irreversible degeneration of kidney function that requires kidney transplantation, and patients must undergo dialysis until a suitable donor is identified. More than 60,000 individuals around the world die each year from kidney diseases. Chronic kidney disease is prevalent in the world, with 242 cases per one million individuals, and it continues to increase by 8% annually (1). In 2030, it is estimated that more than two million individuals will require dialysis (2). There are about 45 thousand hemodialysis patients in Iran in 2021 (3). Chronic kidney disease and its related treatment methods, such as hemodialysis,

have an impact on a person's lifestyle, health status, and roles, and in the long run, it will result in a decrease in living standards and physical and mental problems (2). Patients' life expectancy can be increased by hemodialysis; however, it can also lead to psychosocial problems, such as depression and anxiety disorders (4).

According to research conducted in Iran and other countries, these patients have a high prevalence of depression and anxiety (5). A study conducted by Delshad et al. demonstrated that 63.05% of dialysis patients were experiencing depression (6). Considering the high prevalence of depression among kidney patients and due to a



significant statistical relationship observed between depression and dialysis adequacy in hemodialysis patients, the timely diagnosis and effective treatment of mental disorders, including depression and anxiety, can improve the quality of life, disease prognosis, and patient survival (7). If dialysis is not done well enough, it can leave many physical and mental side effects (8).

The adequacy of hemodialysis is determined by the ability to remove toxins and waste products from the patient's blood, which greatly affects their overall well-being (9, 10). Chronic hemodialysis patients' clinical outcome is greatly affected by ensuring they receive an adequate dose of hemodialysis, as measured by Kt/V or urea reduction ratio (11).

## 2. Objectives

Taking into account the absence of research in the field of depression and anxiety factors, which have a significant impact on the quality of life of dialysis patients, this study was conducted in Birjand, Iran, to examine the relation between dialysis effectiveness and depression and anxiety for hemodialysis patients at Shahid Beheshti Center at Birjand University of Medical Sciences.

## 3. Methods

This descriptive-analytical cross-sectional study was conducted on patients referred to the Hemodialysis Center of Shahid Beheshti hospital in Birjand. A total of 100 patients with chronic kidney failure who underwent hemodialysis 2 - 3 times in 1 400 weeks and each time for 4 hours were included in the study. Based on a study by Shin et al. (12), the correlation between dialysis adequacy and psychological disorders is equal to 0.31. Moreover, considering the confidence limits of 90% and power of 80%, the sample size was calculated to be 80 patients. Due to the possibility of incomplete cases and in the absence of data completion, the final sample size was considered to be 100 patients.

The selection of patients was simple and based on the list of patients. The required information was collected in the form of a questionnaire. This questionnaire included three parts: demographic information, standard

Hospital Anxiety and Depression Scale (HADS), and dialysis adequacy score. Demographic information included age, gender, and marital status. The Hospital Anxiety and Depression Scale includes seven items related to anxiety symptoms (items 1, 4, 5, 8, 9, 12, and 13) and seven items about depression symptoms (items 2, 3, 6, 7, 10, 11, and 14). This questionnaire was scored based on a four-point Likert scale of 0, 1, 2, and 3. The total score of each of the 2 anxiety or depression scales is within the range of 0 - 21, where the scores of 11 - 21 in each of the two scales are clinically suspicious, scores of 8 to 10 are intermediate and abnormal, and scores of 0 to 7 are considered healthy. In this study, score 11 is considered the cut-off point. This questionnaire has already been used in a study by Nezami ghale noe et al. (2020), and its validity and reliability have been confirmed by Cronbach's  $\alpha \geq 0.78$  (13).

In this study, the KT/V formula was used to evaluate the dialysis adequacy score, and the numerator and denominator of the deduction were available in patients' records in the dialysis center. If this score is more than 1.2, it means that dialysis is satisfactory. The identification of the effective removal of a specific solute (clearance K) is achieved by a given treatment (characterized by time t) in a given patient with a specific volume of distribution V for the solute considered. Kt/V is a number that does not have any dimensions in operation (14).

After collecting the data, it was entered into SPSS 19 software. Descriptive statistics, including mean, standard deviation, frequency, and frequency percentage, were used to describe the data. An independent t-test and Pearson correlation coefficient were used to analyze the data and examine the relationships between variables. In this study,  $\alpha = 0.05$  was considered the significance level.

This study was approved by the Ethics Committee of Birjand University of Medical Sciences with code IR.BUMS.REC.1400.425. In addition, the participants completed the informed consent form before participating in the study.

## 4. Results

The average age of the patients was  $60.53 \pm 17.10$  years. Most of the examined patients were married (87%) and male (62%) (Table 1).

**Table 1.** Status of Demographic Characteristics of Participants

Variables	No. (%)
<b>Marriage status</b>	
Single	13 (13)
Married	87 (87)
<b>Gender</b>	
Male	62 (62)
Female	38 (38)

According to Table 2 and the determined cut-off point, 18% of the surveyed individuals had depression, and in terms of suffering from anxiety, 82% of the surveyed indi-

viduals reported anxiety. Additionally, 31% of individuals were not at a favorable level in terms of dialysis adequacy. Accordingly, no significant difference was observed

between the mean scores of depression and anxiety between the two genders ( $P > 0.05$ ). Moreover, no difference

was observed between depression and anxiety scores and marital status ( $P > 0.05$ ) (Table 3).

**Table 2.** Distribution of Depression, Anxiety, and Dialysis Adequacy in Studied Hemodialysis Patients

Variables	No. (%)
<b>Depression</b>	
Yes	18 (18)
No	82 (82)
<b>Anxiety</b>	
Yes	82 (82)
No	18 (18)
<b>Dialysis adequacy</b>	
Yes	69 (69)
No	31 (31)

**Table 3.** Comparison of Depression and Anxiety Scores in Hemodialysis Patients According to Gender and Marital Status

Variables	Mean $\pm$ SD	P-Value <sup>a</sup>
<b>Depression</b>		
<b>Gender</b>		0.738
Male	9.08 $\pm$ 1.40	
Female	8.97 $\pm$ 1.76	
<b>Marriage status</b>		0.249
Single	9.04 $\pm$ 1.50	
Married	9.00 $\pm$ 1.87	
<b>Anxiety</b>		
<b>Gender</b>		0.921
Male	12.79 $\pm$ 2.19	
Female	12.28 $\pm$ 1.91	
<b>Marriage status</b>		0.653
Single	12.56 $\pm$ 2.09	
Married	12.84 $\pm$ 2.19	

<sup>a</sup> Independent samples t-test

There was a negative correlation between age and anxiety score ( $r = -0.29$ ,  $P = 0.003$ ), which means with age, anxiety increases in hemodialysis patients. Furthermore, a positive and significant correlation was observed

between age and depression score ( $r = 0.26$ ,  $P = 0.003$ ), which means with age, depression increases in hemodialysis patients. Additionally, the correlation between dialysis adequacy and anxiety and depression scores was not significant ( $P > 0.05$ ) (Table 4).

**Table 4.** Correlation Between Age and Dialysis Adequacy with Anxiety and Depression Scores

Variable	Dialysis Adequacy	Anxiety	Depression
<b>Age</b>			
r Pearson coefficient	-0.07	-0.29	0.26
P-value	0.47	0.003	0.003
<b>Dialysis adequacy</b>			
r Pearson coefficient	-	-0.01	0.02
P-value	-	0.86	0.82

## 5. Discussion

In this study, which was conducted to determine the state of depression, anxiety, and dialysis adequacy in

hemodialysis patients in Birjand and investigate the relationship between depression and anxiety with dialysis

adequacy, the prevalence of depression and anxiety in the investigated patients was 18% and as 82%, respectively. Contrary to the results of the present study, Zahedian et al., in a study that investigated the prevalence of depression and anxiety in hemodialysis patients in Qazvin, Iran, reported the prevalence of depression in these patients as 65.8% (15).

The prevalence of depression in patients with chronic diseases can be influenced by a variety of factors. These factors include age, marital status, employment status, monthly income, number of children, and belief in religious and spiritual beliefs (16, 17). In Birjand, the family still has a vital role to play in supporting patients due to its social structure and the high level of religious and spiritual beliefs in this province, and justifying the lower prevalence of depression in the present study patients might be feasible (18). On the other hand, South Khorasan province and Birjand have a high rate of childbearing, which leads to an increase in life expectancy (19); probably, this issue can account for the decrease in depression rates among dialysis patients in this province when compared to other provinces in the country (20).

Examining the state of anxiety in the studied hemodialysis patients also showed that 82% of the patients suffer from anxiety. Contrary to the results of this study, Zahedian et al., in research using the Beck questionnaire, showed that 13.3% of patients had anxiety symptoms and were suffering from this disorder (15). This difference in the results of the current study and Zahedian's study can be influenced by the use of different scales in collecting information from patients. However, Najafi et al., in a similar study to the present study, used the HADS to assess anxiety in hemodialysis patients of Tehran, Iran. They achieved results closer to those of the present study. In Najafi et al.'s research, the prevalence of depression and anxiety was measured at 31.5% and 41.7%, respectively (21). Although the prevalence of depression in the aforementioned study was higher than in the current study, the result was closer to the result of the present study.

The results of this study showed that the hemodialysis performed in 69% of the studied patients was sufficient. Other studies conducted in different provinces of the country, which investigated the correlation of dialysis adequacy with different variables, reached similar percentages of dialysis adequacy. In a study by Almasi et al. in Sanandaj, similar to the present study, dialysis adequacy calculated based on KT/V was greater than 1.2 in 60% of patients (22).

Next, the scores of depression and anxiety in patients were examined and compared based on the demographic variables of gender and marriage, and no significant relationship was observed between the prevalence of depression and anxiety with any of the variables of gender and marriage. To date, studies have expressed different and sometimes contradictory results regarding the role of demographic variables in the prevalence of depression and anxiety in hemodialysis patients (23). Consistent

with the aforementioned results, Soleimani Moghadam et al. did not find a significant relationship between the prevalence of depression and anxiety with age, gender, income level, and marital status in patients (24). Raisi et al., in their study, which had the same results as the present study and investigated the frequency of depression in hemodialysis patients of Imam Khomeini hospital in Tehran, stated that marital status is not a reinforcing factor in the prevalence of depression in hemodialysis patients. However, they further explained that marital problems caused by chronic illness can be effective in increasing the prevalence of depression in dialysis patients (24).

According to the results, with increasing age, the depression score increased significantly ( $P = 0.009$ ), and the prevalence of anxiety decreased ( $P = 0.003$ ). The prevalence of depression in healthy individuals and patients has been investigated by other studies at national and international levels, and they have shown the same results as those of the present study (25, 26). The increase in the prevalence of depression among hemodialysis patients due to their age can be caused by the decrease in their life expectancy. Younger patients studied might have higher anxiety prevalence due to mental concerns related to their work environment, family, or children (27). According to the results of the present study, there is no relationship between dialysis adequacy and depression and anxiety. In Najafi et al.'s study, as in the current study, there was no significant relationship between the adequacy of dialysis and the prevalence of depression and anxiety in patients. This study compared the two indicators of urea reduction and KT/V and showed that the adequacy of none of these indicators has a significant relationship with the prevalence of depression and anxiety in patients (21)a.

### 5.1. Conclusion

The adequacy of dialysis in patients undergoing hemodialysis treatment remains unaffected by mental disorders, such as anxiety and depression. Gender does not influence the levels of anxiety or depression in patients. Nevertheless, age has a significant impact on depression and anxiety levels in patients receiving hemodialysis treatment. To reduce anxiety and depression in younger patients and older patients, it is recommended to initiate support and educational programs.

### 5.2. Limitations

Similar to all studies, the present study had some limitations. The most important limitation of this online study was the self-reporting of the questionnaire, which should be performed with caution when generalizing the results to the general public.

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