

# Depression, Anxiety, and Stress in Patients Undergoing Hemodialysis: Assessment of Contributing Factors

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**Abstract: Background:** The frequency of Chronic Kidney Disease (CKD) assessed worldwide is 13.4% (11.7-15.1%), and cases with ESKD demanding renal replacement therapy are calculated to be between 4.902 and 7.083 million. Several factors prompt anxiety and depression in hemodialysis cases. These include co-morbidities, frequent hospitalizations, habitual pain, sleep disturbances, chronic inflammation, increased fatigue, uremia, failure of family support, non-compliance to adjunctive therapeutics such as restrictions in diet and fluids, and dependence upon treatment and health professionals.

**Objective:** To assess the frequency and contributing factors for incidents of depression, stress, and anxiety in hemodialysis patients.

**Materials and Methods:** This is an observational, cross-sectional study conducted at the Karachi Institute of Kidney Diseases from February 2023 to March 2023, the obtained minimum sample size was 194. Data was collected with the help of DASS 10 questionnaire. The data was entered and analyzed by using Statistical Package of Social Sciences (SPSS) Version 22. Data significance was analyzed using Chi-Square test keeping P- value  $\leq 0.05$  as significant.

**Result:** A total of 194 participants were recruited in the study, gender distribution recorded male dominance at 103 (53%) and females at 91 (46%). 139 (71.6%), the mean value of the length of dialysis was  $15.4 \pm 4.9$  years while the mean days of dialysis were  $2.7 \pm 1.3$ . Moderate depression was reported in 101 (52%) of the study participants, while severe depression was reported in 25 (12.8%). Anxiety was reported as mild most frequently with 133 (68.5%) while stress was reported as mild in 48 (24.7%), moderate in 83 (42.7%), and severe in 63 (32.4%) with a p-value of 0.214. We identified a positive association of severe depression, anxiety, and stress with age  $\leq 45$  years in general, while participants from the upper middle class reported stress more frequently.

**Conclusion:** This study concluded that compromised socio-economic status, young age, and higher prognosis rates are contributing factors for depression, anxiety, and stress in hemodialysis patients.

**Keywords:** DASS, Depression, Hemodialysis, ESKD, Stress, Anxiety.

## INTRODUCTION

End Stage Kidney Disease (ESKD) occurs as a result of declined functioning of the renal system that requires dialysis or transplantation. The frequency of Chronic Kidney Disease (CKD) assessed worldwide is 13.4% (11.7-15.1%), and cases with ESKD demanding renal replacement therapy are calculated to be between 4.902 and 7.083 million [1]. It is estimated that the number of dialysis cases will reach 5.5 million in 2030 [2]. The exact number of ESKD cases in Pakistan is not identified because no public or indigenous registries are present. Nonetheless, a population-grounded study calculated the ESKD prevalence rate at 152 per million in India and 100 per million in Pakistan [3].

Depression and anxiety are psychological disorders encountered due to hormonal imbalance, traumatic incidents, loss of

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normality, and disturbed mental health, and impact a person's health negatively. The term secondary depression was originally used for cases who had a primary psychiatric illness and later developed depression but also it was made more comprehensive to grasp affective diseases arising as a result of other afflictions or adverse responses to medicines [4]. One of the situations that display implicit secondary depression, stress, and anxiety is the group of cases undergoing dialysis due to ESKD. Depression is the most generally encountered psychiatric condition among the cases of ESKD and it is seen to be much advanced in cases bound for hemodialysis as opposed to the normal population [2, 3]. The term psycho-nephrology was befittingly devised by Levy to signify the cases who had psychiatric problems and were witnessing dialysis due to ESKD [5].

There is substantial evidence that depression in hemodialysis cases is associated with mortality [6]. It is not duly diagnosed in HD cases because healthcare providers involved in their treat-

ment plan cannot give attention to controlling depression due to the nature of their illness. There's a need for regular perpetration of webbing of depression among this population as depression and anxiety both massively affect the quality of life [7].

Several factors prompt anxiety and depression in hemodialysis cases. These include co-morbidities, frequent hospitalizations, habitual pain, sleep disturbances, chronic inflammation, increased fatigue, uremia, failure of family support, non-compliance to adjunctive therapeutics such as restrictions in diet and fluids, and dependence upon treatment and health professionals [8]. Anxiety has been the lesser investigated psychological factor among these patients as depression has been the center of attention in most studies. In the general population in the United States, anxiety prevails at 18% and in patients with ESKD, the prevalence is an appalling 38% (12-52%) [9].

It has been observed that in a majority of cases, healthcare professionals tend to focus on the biological or technical aspects of the disease. The psychological impact of such diseases should also be addressed and evaluated [10]. Undervalued or undetected anxiety and depression may lead to diminished quality of life among both cases and caregivers. Therefore, all patients with debilitating disease conditions should be encouraged to the exposure of psychological assessment.

In this study, we aim to assess the frequency and contributing factors of stress, depression, and anxiety for hemodialysis patients.

## MATERIALS AND METHODS

This is an observational, cross-sectional study conducted at Karachi Institute of Kidney Diseases from February 2023 to March 2023, on patients who were on maintenance Hemodialysis (HD) for more than 3 months of both genders, aged between 18 to 40 years. Patients with known psychological problems, a history of diagnosed depression, anxiety, and stress, a history of anti-anxiety or anti-depressant medicines, and any traumatic incident in family or friends within the last three months were excluded from the study. The sample size was calculated with the help of the RaoSoft sample size calculator keeping the Confidence Level at 95% and the margin of Error at 5% and the population size was determined by the number of dialysis patients present at the time of the study which was 480. The obtained minimum sample size is 194\*.

The data was collected with the help of a pre-structured, validated questionnaire containing Part 1 as demographic details; Part 2 will obtain study-related history including clinical history, family history, any relevant disorder history, any diagnosed psychological issue, and/or any recent traumatic incident. Part 3 of this questionnaire will contain the Depression-anxiety-stress Scale (DASS) 10 questionnaire [11]. It is a validated questionnaire which is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress. The DASS is based on a dimensional conception of

psychological disorder and can discriminate between the three related states of depression, anxiety, and stress.

## STATISTICAL ANALYSIS

The data was entered and analyzed by using Statistical Package of Social Sciences (SPSS) Version 22. The normality of the data was analyzed by simple data stratification. Dependent variables were analyzed with the help of frequency, percentages, mean values, and Standard Deviation tests. Independent variables were analyzed with the same test, however, data significance was analyzed using Chi-Square test keeping the P- P-value  $\leq 0.05$  as significant. The association between the two variables was assessed by using paired sample T-test/cross-tabulation.

## RESULT

A total of 194 participants were enrolled in the study, age categories and gender distribution are represented in Figs. (1) and (2).

### Gender Distribution

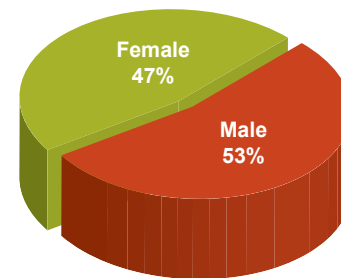


Fig. (1). Gender Distribution of Study Participants.

### Age Distribution

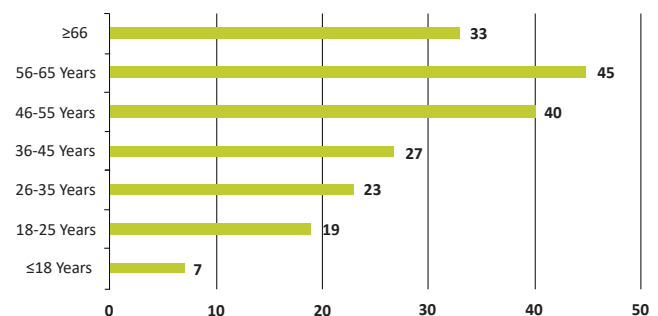


Fig. (2). Age Distribution of Study Population.

139 (71.6%) study participants reported a positive family history of hypertension, Diabetes mellitus and 42 (21.6%) reported a positive family history of kidney disease. The most frequently reported comorbidity was hypertension in 109 (56.1%) of patients, hypertension along with diabetes mellitus was reported in 37 (19%) of patients while only diabetes mellitus was reported in 48 (24%). 111 (57.2%) of study participants reported their monthly income as less than 50,000 PKR and cat-

egorized as lower middle class, while 18 (9.2%) reported their monthly income as less than 30000 pkr and categorized as lower class. Only 65 (33.5%) reported monthly income of fewer than 100,000 PKR and were categorized as upper middle class. Dialysis details were documented as the duration of dialysis and days of dialysis, the mean value of dialysis duration was  $15.4 \pm 4.9$  years while the mean weakly days on dialysis were  $2.7 \pm 1.3$ . the duration of dialysis was further categorized into years and reported results indicated 61 (31.4%) patients with less than 5 years of dialysis while maximum patients had dialysis from 6 to 10 years with 77 (39.6%) (Fig. 3).

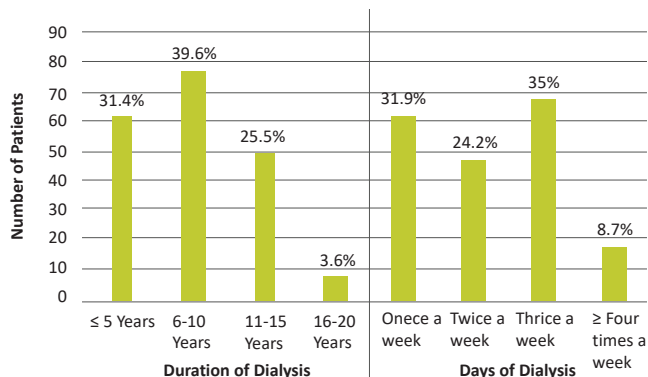


Fig. (3). Dialysis Details of Study Participants.

While overall DASS score represented anxiety stress and depression separately, moderate depression was reported in 101 (52%) of study participants, while severe depression was reported in 25 (12.8%). Anxiety was reported as mild most frequently with 133 (68.5%) while stress was reported as mild in 48 (24.7%), moderate in 83 (42.7%), and severe in 63 (32.4%) (Table 1).

Table 1. DASS Results in Study Participants.

| Symptoms   | Mild n (%)  | Moderate n (%) | Severe n (%) |
|------------|-------------|----------------|--------------|
|            | Score ≤ 6   | Score 07 to 12 | Score ≥ 13   |
| Depression | 68 (35%)    | 101 (52%)      | 25 (12.8%)   |
| Anxiety    | 133 (68.5%) | 44 (22.6%)     | 17 (8.7%)    |
| Stress     | 48 (24.7%)  | 83 (42.7%)     | 63 (32.4%)   |

Upon categorizing the DASS score with other demographic variables of the study we identified a positive association of severe depression, anxiety, and stress with age ≤ 45 years in general, females were more prone to get severe depression, stress, and anxiety while participants from upper middle class reported stress more frequency while depression as reported in lower-class participants. However, comorbidities were reportedly not associated with the DASS score (Table 2).

Table 2. Association of DASS with Demographics and Dialysis Details.

| Symptoms       |                    | Depression n=25 | P-Value | Anxiety n=17 | P-Value | Stress n=63 | P-Value |
|----------------|--------------------|-----------------|---------|--------------|---------|-------------|---------|
| Age Categories | ≤ 18 years         | 9 (4.6%)        | 0.412   | 8 (4.1%)     | 0.324   | 3 (1.5%)    | 0.134   |
|                | 18-25 years        | 6 (3%)          |         | 2 (1%)       |         | 11 (5.6%)   |         |
|                | 26-35 years        | 3 (1.5%)        |         | 3 (1.5%)     |         | 12 (6.1%)   |         |
|                | 36-45 years        | 2 (1%)          |         | 1 (0.5%)     |         | 5 (2.5%)    |         |
|                | 46-55 years        | 3 (1.5%)        |         | 3 (1.5%)     |         | 6 (3%)      |         |
|                | 56-65 years        | 2 (1%)          |         | 0            |         | 8 (4.1%)    |         |
|                | ≥ 66 years         | 0               |         | 0            |         | 18 (9.2%)   |         |
| Gender         | Male               | 11 (5.6%)       | 0.026   | 6 (3%)       | 0.181   | 29 (14.9%)  | 0.035   |
|                | Female             | 14 (7.2%)       |         | 11 (5.6%)    |         | 34 (17.5%)  |         |
| SES            | Upper Middle Class | 4 (2%)          | 0.921   | 3 (1.5%)     | 0.738   | 23 (11.8%)  | 0.818   |
|                | Lower Middle Class | 14 (7.2%)       |         | 6 (3%)       |         | 22 (11.3%)  |         |
|                | Lower Class        | 7 (3.6%)        |         | 8 (4.1%)     |         | 18 (9.2%)   |         |
| Marital Status | Unmarried          | 11 (5.6%)       | 0.718   | 4 (2%)       | 0.449   | 35 (18%)    | 0.616   |
|                | Married            | 8 (4.1%)        |         | 11 (5.6%)    |         | 11 (5.6%)   |         |
|                | Widowed/Divorced   | 6 (3%)          |         | 2 (1%)       |         | 17 (8.8%)   |         |
| Family History | HTN                | 8 (4.1%)        | 0.381   | 4 (2%)       | 0.611   | 12 (6.1%)   | 0.712   |
|                | DM                 | 10 (5.1%)       |         | 2 (2%)       |         | 32 (16.4%)  |         |
|                | Kidney Disease     | 7 (3.6%)        |         | 11 (5.6%)    |         | 19 (9.7%)   |         |
| Comorbidities  | HTN                | 4 (2%)          | 0.734   | 2 (1%)       | 0.552   | 12 (6.1%)   | 0.821   |
|                | DM                 | 3 (1.5%)        |         | 1 (0.5%)     |         | 9 (4.6%)    |         |
|                | HTN + DM           | 8 (4.1%)        |         | 5 (2.5%)     |         | 18 (9.2%)   |         |

Continue

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|                      |                     |           |       |          |       |            |       |
|----------------------|---------------------|-----------|-------|----------|-------|------------|-------|
| Duration of Dialysis | ≤ 5 years           | 13 (6.7%) | 0.195 | 4 (2%)   | 0.813 | 22 (11.3%) | 0.892 |
|                      | 6-10 years          | 5 (2.5%)  |       | 9 (4.6%) |       | 18 (9.2%)  |       |
|                      | 11-15 years         | 4 (2%)    |       | 1 (0.5%) |       | 12 (6.1%)  |       |
|                      | 16-20 years         | 3 (1.5%)  |       | 3 (1.5%) |       | 11 (5.6%)  |       |
| Days of Dialysis     | once a week         | 2 (1%)    | 0.676 | 2 (1%)   | 0.584 | 0          | 0.219 |
|                      | twice a week        | 5 (2.5%)  |       | 1 (0.5%) |       | 22 (11.3%) |       |
|                      | Thrice a week       | 7 (3.6%)  |       | 8 (4.1%) |       | 14 (7.2%)  |       |
|                      | ≥ Four times a week | 11 (5.6%) |       | 1 (0.5%) |       | 9 (4.6%)   |       |

## DISCUSSION

The impact of CKD leading to ESKD has adverse effects on patients, especially in developing countries like Pakistan. Several factors contribute to this situation. Patients who undergo maintenance hemodialysis therapy experience various burdens, including mental, physical, social, and financial stressors. Consequently, these individuals often face elevated levels of depression, anxiety, and stress. Notably, anxiety appears to be particularly prominent, with the current study revealing 26.8% of patients experiencing mild anxiety, 5% experiencing moderate anxiety, and 4.3% experiencing severe anxiety. These figures are consistent with a study by Bujang *et al.*, which indicated even higher levels of anxiety (46.6%) among dialysis patients compared to rates of depression (36.3%) and stress (26.3%) [12].

These findings underscore the significant psychological challenges that dialysis patients endure. Therefore, it is crucial for medical practitioners caring for these patients to be attentive to their mental well-being, actively screen for any of the aforementioned symptoms, and promptly refer them to appropriate departments for the preferred treatment options [13].

Based on our research findings, patients from the lower-middle class demonstrated a higher prevalence of depression compared to individuals from both lower and upper classes. This highlights the significant responsibility of the government and healthcare organizations in improving and reducing the cost of healthcare services. This can be achieved through various measures, such as enhancing the accessibility of healthcare services, supporting the development of affordable medical treatments, and implementing effective screening tools for psychological symptoms. Additionally, governments could offer incentives to international manufacturers to expedite licensing and registration processes for dialysis equipment or collaborate with suppliers to implement cost-containment strategies for medical treatments [14].

We found no significant disparity in the occurrence of depression between the two genders. However, it was noteworthy that anxiety was relatively more prevalent among males, while stress showed a slight upward trend among females. It is important to mention that in the general population, females are more prone to experiencing depression and anxiety, as supported by studies [15]. However, in the context of CKD, some research suggests that males may be more susceptible to depression and anxiety due to the financial responsibility they often shoulder [16].

## LIMITATION

There are some limitations in our study. The first one is that we used a questionnaire system to assess the required dimensions instead of having evaluations conducted by mental health professionals [17]. However, it is worth noting that many studies have attested to the accuracy and reliability of the DASS scoring system. The DASS questionnaire system has been shown to provide reliable psychological measurements and exhibits better distinction in factor loading compared to other scales like the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) [18]. While statistical analysis is typically more representative of the entire population when using a sample size of at least 500, the sample size of our study may be smaller. Moreover, Bujang *et al.* also support the idea that a larger sample size increases the likelihood of obtaining results that better reflect the overall population [13, 19, 20]. There was a substantial amount of overlap (28.6%) between the symptoms of anxiety and depression in the study by Merthoenius M, *et al.* [21] may be accounted for by the theory that anxious depression is an inflammatory condition. Camacho explained, there is genetic, immunological, and biochemical evidence that anxious-depression is an inflammatory illness. It has been discovered that alterations in a number of biological variables that are essential in the production of a systemic inflammatory response are linked to the feelings of anxiety and depression [22].

The numerous comorbidities of depression also raise the neuro-inflammatory load and are highly correlated with a worse quality of life. Antidepressant usage, either present or historical, was linked to the physical health area of patients' quality of life [23]. This result was consistent with the idea that patients' quality of life is enhanced by antidepressant medication. However, further research is need to fully understand this conclusion. Depressive symptoms were also linked to emotional and physical problems. In addition to physical concerns pertaining to a patient's medical state, anxiety frequently presents as somatic issues [24]. Anxiety disorder sufferers have worsening health, psychological difficulties, and a lower standard of living. Anxiety and depression were shown to be strongly correlated in a study involving hemodialysis patients. Anxiety disorders can be diagnosed and treated to help people see other needs and delay the onset of sadness [25].

## CONCLUSION

This study concludes that stress is the most commonly experienced issue in hemodialysis patients followed by depression. Socio-economic status (< 50000 /month income), delayed diagnosis and/or dialysis, and younger age (<45 years) are independent contributing factors of depression, anxiety, and stress in hemodialysis patients.

## AUTHORS' CONTRIBUTION

- **Khurram Danial:** Subject Specialist, Final Approval.
- **Naseha Mushtaq:** Data Collection, Write-up.
- **Erum Alam:** Data entry, Write-up.
- **Maliha Mushtaq:** Ethical Consideration, Write-up.
- **Sana Tariq:** Data Analysis, Results interpretation, Data representation.

## CONFLICT OF INTEREST

Declared none.

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