

The Burden of Depression among Patients with End Stage Renal Disease undergoing Haemodialysis at Kenyatta National Hospital, Nairobi Hospital, and Parklands Kidney Center, Nairobi, Kenya

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Abstract

Background: Depression is the commonest psychological disorder in End Stage Renal Disease (ESRD). The presence of depression has been linked with high rates of morbidity and mortality, as well as having an impact on the quality of life. Early diagnosis and treatment of depression in chronic kidney disease improves disease outcome.

Objectives: The main objective of this study was to determine the prevalence of depression in end stage renal disease patients undergoing maintenance haemodialysis at the Kenyatta National Hospital (KNH), Nairobi Hospital (NH), and Parklands Kidney Centre (PKC).

Design: This was a cross sectional descriptive study carried out over a period of two months.

Methods: The study population comprised of adults aged 18 years and above undergoing maintenance haemodialysis. Informed consent was sought from all the participants. A study pro forma was used to collect socio-demographic data. The Patient Health Questionnaire 9 (PHQ - 9) was used to establish presence and severity of depression among participants. The multidimensional scale of perceived social support was used to assess the level of social support among the study participants.

Data management and analysis: The prevalence of depression was calculated as a proportion of patients with any degree of depression and expressed as a percentage. The chi-square test was used to determine the association between presence of depression, and

selected social demographic determinants. Analysis was done using SPSS version 21.0 Chicago Illinois.

Results: A total of 170 patients were recruited with a mean age of 56.44 ±13.5 years and a sex ratio (M:F) of 1.2:1. The prevalence of depression was 32.4%, mild depression 24.14%, moderate 7.06% and severe 1.17%. High social support was present for 74.12% of subjects who participated, while 23.53% and 2.35% had moderate and low social support respectively. Age (18 - 29 years, p = 0.005), lack of any formal education (p = 0.048), retirement from formal employment (p = 0.036) and lack of social support (p = 0.001) were significantly associated with depression.

Conclusion: A substantial proportion of subjects undergoing haemodialysis have concomitant depression with the majority having mild depression. Factors that increased the risk of depression were age, lack of formal education, retirement from formal employment and lack of social support. Carrying out of validated questionnaires to assess for the presence of depression in patients initiating haemodialysis may be helpful in early recognition and management. This would improve the quality of life and clinical outcomes in patients diagnosed with end stage renal disease undergoing haemodialysis.

Key words: Chronic Kidney Disease (CKD), Depression, End Stage Renal Disease (ESRD), Haemodialysis (HD), Patient Health Questionnaire – 9 (PHQ - 9), Multidimensional Scale of Perceived Social Support (MSPSS)

Introduction

End Stage Renal Disease (ESRD) represents the final stage in the spectrum of Chronic Kidney Disease (CKD); According to Kidney Disease Improving Global Outcomes (KDIGO) classification an estimated Glomerular Filtration Rate (eGFR) of < 15 ml/min/1.73 indicates ESRD (1). CKD involves the sustained gradual loss of the kidney's ability to perform its normal function, thus leading to the accumulation of metabolic waste normally excreted by the kidneys. The presence of ESRD therefore necessitates the need

for Renal Replacement Therapy (RRT), to maintain life and improve the quality of life. The primary signs and symptoms of ESRD are as a result of metabolic or endocrine derangements or disturbance in water or electrolyte balance.

The estimated lifetime risk of developing depression in the general population is estimated to be between 5 – 10%, worldwide the prevalence of CKD is 10 – 15% (2-5). The rates of depression are up to three times higher than that seen in the general population for CKD/ESRD patients who are not undergoing HD. When this group of patients is compared to those who

are suffering from other chronic medical ailments the rates of depression are 2 - 3 times higher (2,6). The burden of CKD is envisaged to substantially grow owing to a worldwide pandemic of some of the aetiological factors associated with CKD e.g. Hypertension (HTN) and Diabetes Mellitus (DM). In Kenya the prevalence of DM is approximately 4.2%, (7) while that of hypertension is estimated to be 24.5% (18-69 years) (8). Therefore, with an increasing proportion of the population having risk factors for development of CKD, it is likely therefore that the number of patients requiring RRT in the near future is going to increase.

Depression is a mental disorder characterized by hopelessness, anhedonia, and a constant feeling of sadness for at least 2 weeks, according to the diagnostic and statistical manual of mental disorders (DSM – V). Other symptoms include significant weight loss, slowing down of thoughts, suicidal ideation, feeling of worthlessness, restlessness, insomnia, guilt and reduced concentration. Depression results from a complex interplay between social, biological, and psychological factors. The lifetime prevalence of depression is as high as 20% in the general population, with a female: male ratio of 1.7:1 (9). Globally approximately 350 million people are affected by depression, this has led to depression being the 4th leading cause of disability (10). Approximately 800,000 people diagnosed with depression commit suicide globally on an annual basis (10). A study carried out in the year 2002 in a rural district in Kenya showed the prevalence of depression to be approximately 6.1% (11).

The assessment of depression in patients with CKD is demanding, this is partly due to the fact that there is an overlap between the physical symptoms of uraemia and depression. Patients who have been diagnosed with ESRD show greater than five times the rate of developing depression, compared to the general population (12).

End stage renal disease/chronic kidney disease patients who are also depressed tend to be less motivated, have poor disability score and are less compliant to their treatment. The association between depression and mortality has been established in several studies. In a study published by Mapes *et al* (13) in 2004, the presence of depression was shown to have an independent association with increasing rates of mortality and hospitalization. Data compiled from 31 studies comprising of 67,000 patients on chronic maintenance HD, demonstrated a 50% increase risk of mortality with the existence of depressive symptoms (14). In CKD patients currently not on HD, the presence of depressive symptoms was associated with a higher rate of progression of CKD to ESRD (15).

Depression is associated with increasing rates of negative health behaviour such as a sedentary lifestyle, smoking and obesity which contribute to an increase in other lifestyle diseases in these patients i.e. DM and HTN. The interplay between depression and ESRD becomes a vicious cycle leading to high rates of health care utilization with increased economic cost. Depression remains largely under-diagnosed by health care providers in patients with ESRD undergoing HD thus leading to low quality of life and poor patient outcomes. Early diagnosis and intervention of depression can lead to less ESRD related morbidity and mortality.

There is no known local published data on prevalence of depression on this group of patients. The study aimed at filling in the gaps that currently exist in our set up by establishing the prevalence of depression and looking at selected determinants associated with depression among ESRD participants undergoing HD.

Materials and methods

Study design: This was a descriptive cross-sectional study.

Study sites: This study was carried out at the renal units of KNH, NH and PKC.

Study population: These were ambulatory adult patients with ESRD undergoing maintenance HD at the renal units in KNH, NH and PKC.

Inclusion criteria

- (i) Patients aged 18 years and above who had ESRD and were undergoing maintenance HD.

Exclusion criteria

- (i) Patients who did not give informed consent.
- (ii) Patients who had any form of cognitive impairment.

Sampling method

Recruitment occurred between 0800 hours to 1800 hours every day of the week. The sampling frame was from all booked patients for HD in each of the three renal units. The principal investigator and trained medical research assistants perused the clinic booking register a day before the clinic and extracted the medical files. On the recruitment day the principal investigator and a trained medical research assistant approached each patient in order of their arrival time to the dialysis unit, each eligible patient was given an opportunity to take part in the study.

Data collection procedure

Patients who were on maintenance HD were invited to participate in the study. Those who met the inclusion criteria were given information about the study and asked to participate. Eligible patients who agreed to participate in the study were given the written informed consent to sign and consequently recruited to the study. A study pro forma filled in by the patient with the assistance of the PI/ research assistant was used to collect socio demographic and comorbidity data.

This information was then verified from the patients' medical file. The PHQ – 9 and MSPSS was administered in either English or Swahili depending on the participants' preference. Study participants with difficulty in completing the questionnaire were assisted by either the PI or research assistant. Once data had been collected, it was kept safely in a locker only accessible to the researcher.

Study variables

Dependent variable

(i) Depression

A patient with a PHQ – 9 score of 10 or more was described as having clinical depression. The severity of depression was graded as follows, depending on the PHQ – 9 scores: mild (10 – 14), moderate (15 – 19) and severe (20 – 27).

Independent variables

- (i) *Age*: Described in years as at of the last birthday.
- (ii) *Gender*: Described as either female/ male.
- (iii) *Marital status*: This was categorized as either single, married, separated, divorced or widowed.
- (iv) *Employment status*: The status of an economically active individual with respect to his/her employment. This was assessed by inquiring whether the activity one was involved in lead to a source of gainful income, or if one had retired from gainful employment that in turn had led to a decline in once source of income. It was categorized as either employed, non-employed or retired.
- (v) *Level of education*: This was categorized as either having no formal education or having primary, secondary or tertiary.
- (vi) *Duration of dialysis*: This was described in months/ years from the start of maintenance HD.
- (vii) *Level of perceived social support*: This was graded as follows: a score 1 – 2.9 low support; 3-5 moderate support; 5.1 – 7.0 high support.

(viii) *Comorbidities*: This included a history of ever having been diagnosed with cerebrovascular accident, coronary artery disease, or peripheral arterial disease.

(ix) *Status within the family*: This concept referred to the position occupied within the family by each one of its members. It refers to the social status ascribed to each individual in the family based on individual's effort. This was assessed by inquiring who was the provider of the family or gave leadership on family matters. It was categorized as either head of the family, dependant and neither head of the family/ dependant.

Data management and analysis

All data from the study pro forma was verified by the principal investigator and coded. Data analysis was performed using the SPSS Chicago Illinois version 21. Study population was defined using socio-demographic and comorbid characteristics. Continuous variables were summarized as mean and standard deviation. Categorical variables e.g. age, sex, employment status, level of education were presented as proportions. The selected determinants associated with depression were analysed using chi – square tests. The statistical analysis was tested at 5% level of significance. A p value of less or equal to 0.05 was interpreted as significant. Results presentation was done using tables and figures where appropriate.

Results

One hundred and eighty five patients on maintenance HD were enrolled to take part in the study, 15 patients declined to give consent, while 4 patients were excluded due to cognitive impairment based on an expert opinion. A hundred and seventy patients were recruited into the study from KNH, NH, and PKC with a distribution of 70, 65 and 35 patients respectively.

Study population characteristics

A hundred and seventy participants participated in the study of whom 94 (55.3%) were males. The mean age of the respondents was 56.4 ±13.5 years, while the median age was 57.0 (IQR=19.0) years. Participants aged above 50 years accounted for 67.6%, while 72.9% were married, 32.4% were employed, a further 30% had retired from formal employment, 97.6% had attained primary, secondary or tertiary levels of education, indicating a high literacy level (Table 1).

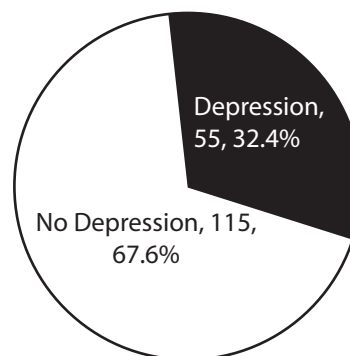
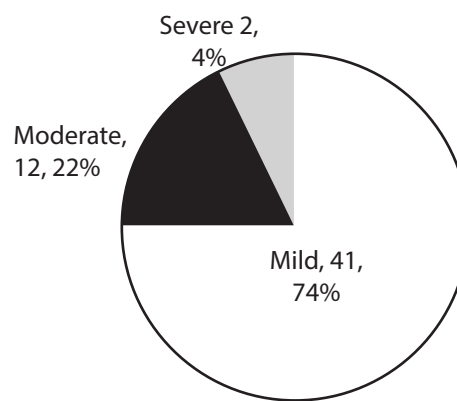
Table 1: Participants socio demographic characteristics

Variable	Categories	Frequency	(%)
Age (years)	18 – 29	3	1.8
	30 - 39	14	8.2
	40 - 49	38	22.4
	50 - 59	43	25.3
	60 - 69	41	24.1
	≥ 70	31	18.2
Gender	Male	94	55.3
	Female	76	44.7
Marital status	Single	14	8.2
	Married	124	72.9
	Separated	3	1.8
	Divorced	6	3.5
	Widowed	23	13.5
Employment status	Employed	55	32.4
	Unemployed	64	37.6
	Retired	51	30.0
Level of education	None	4	2.4
	Primary	31	18.2
	Secondary	54	31.8
	Tertiary	81	47.6
History of alcohol use	Yes	90	52.9
	No	80	47.1
History of smoking/tobacco use	Yes	47	27.6
	No	123	72.4
History of DM	Yes	71	41.8
	No	99	58.2
History of HTN	Yes	144	84.7
	No	26	15.3
Have you ever been diagnosed with MD	Yes	9	5.3
	No	161	94.7

Prevalence and severity of depression

Out of the study population 55 (32.4%) had clinical depression with a PHQ - 9 score ≥ 10 . Among these 41 (74%) had mild depression with a PHQ - 9 score of between 10 – 14, 12 (22%) had moderate depression with a score of between 15 – 19 while 2 (4%) had severe depression with a score of between 20 – 27.

The mean age of those with depression was 53.0 ± 14.3 years, and the mean depression score was 12.5.

Figure 1: Prevalence of depression in ESRD participants undergoing maintenance haemodialysis**Figure 2:** Severity of depression in ESRD participants undergoing maintenance haemodialysis

Factors associated with depression in participants undergoing haemodialysis

Table 2, highlights factors associated with depression among participants undergoing HD. Our study revealed an association of depression among participants who were in the age group between (18 – 29) years ($p < 0.005$), retired ($p < 0.036$), no form of formal education ($p < 0.048$), low or moderate social support ($p < 0.001$). However, this study failed to show any association of depression with marital status, duration of dialysis, comorbidities and status within the family.

Table 2: Selected determinants associated with depression in ESRD participant undergoing HD

Variable	Total	Depression	No depression	OR (95% CI)	P value
Age (years)					
18 - 29	3	3 (100.0)	0 (0.0)	-	0.005
30 - 39	14	7 (50.0)	7 (50.0)	3.4 (0.89 -13.04)	0.066
40 - 49	38	12 (31.6)	26 (68.4)	1.6 (0.54 -4.73)	0.405
50 - 59	43	15 (34.9)	28 (65.1)	1.8 (0.63 -5.14)	0.253
60 - 69	41	11 (26.8)	30 (73.2)	1.3 (0.44 -3.86)	0.680
≥ 70	31	7 (22.6)	24 (77.4)	Ref	
Gender					
Male	94	26 (27.7)	68 (72.3)	Ref	
Female	76	29 (38.2)	47 (61.8)	0.6 (0.3-1.2)	0.146
Marital status					
Single	14	7 (50.0)	7 (50.0)	Ref	
Divorced	6	0 (0.0)	6 (100.0)	-	1.000
Married	124	38 (30.6)	86 (69.4)	0.4 (0.1-1.3)	0.151
Widowed	23	8 (34.8)	15 (65.2)	0.5 (0.1-2.1)	0.363
Separated	3	2 (66.7)	1 (33.3)	2.0 (0.1-27.4)	0.604
Employment status					
Employed	55	21 (38.2)	34 (61.8)	Ref	
Not employed	64	24 (37.5)	40 (62.5)	1.0 (0.48 -2.10)	0.939
Retired	51	10 (19.6)	41 (80.4)	0.4 (0.17 -0.96)	0.036
Level of education					
None	4	3 (75.0)	1 (25.0)	7.6 (0.75 -76.89)	0.048
Primary	31	10 (32.3)	21 (67.7)	1.2 (0.49 -2.94)	0.688
Secondary	54	19 (35.2)	35 (64.8)	1.4 (0.67 -2.93)	0.404
College	81	23 (28.4)	58 (71.6)	Ref	
Duration of dialysis					
<6 months	23	10 (43.5)	13 (56.5)	Ref	
6 months – 1 year	44	17 (38.6)	27 (61.4)	0.8 (0.3-2.3)	0.701
1 year – 5 years	77	18 (23.4)	59 (76.6)	0.4 (0.1-1.1)	0.064
>5 years	26	10 (38.5)	16 (61.5)	0.8 (0.3-2.5)	0.722
Social support					
Low	4	4 (100.0)	0 (0.0)	-	0.001
Moderate	40	21 (52.5)	19 (47.5)	3.5 (1.66 -7.36)	0.001
High	126	30 (23.8)	96 (76.2)	Ref	
History of cardiovascular diseases (CAD, CVA, PAD)					
Yes	17	7 (41.2)	10 (58.8)	1.5 (0.54 -4.18)	0.412
No	153	48 (31.4)	105 (68.6)	Ref	
Status within the family					
Head of family	100	28 (28.0)	72 (72.0)	Ref	
Dependent	65	25 (38.5)	40 (61.5)	1.6 (0.82 -3.11)	0.160
Neither head of family/dependent	5	2 (40.0)	3 (60.0)	1.7 (0.27 -10.72)	0.562

Discussion

The study was designed to determine the burden of depression among ESRD patients undergoing maintenance HD at KNH, NH and PKC. This study determined the prevalence of depression among patients with ESRD undergoing HD to be 32.4% using the PHQ - 9 questionnaire. The distribution of these participants according to severity of depression was 3.6% severe, 21.8% moderate and 74.5% mild depression. There were 55.3% male participants, and the mean age of those with depression was 53.0 ± 14.3 years.

The overall prevalence in our study was similar to other studies worldwide. A study done in Nigeria by Amira (16), found a prevalence of 34.5% among patients undergoing HD using the Zung depression questionnaire. The mean age of those undergoing HD was 42.0 ± 15.0 years, no other socio-demographic categorization was done. A study done in Brooklyn USA by Cukor *et al* (17), found a 29% prevalence of depression among ESRD patients undergoing HD using the BDI screening tool. This study had 52.9% female, 88.6% black respondent, and a mean age 53.3 ± 15.0 years. A large observation study by Boulware and colleagues (18) assessed data from the choice

for healthy outcomes in caring for ESRD (CHOICE) study and found the prevalence of depression to be between 19 – 24%. A meta-analysis by Palmer *et al* (6), found a summary prevalence of 39% among ESRD undergoing HD. Despite the different tools used in all these studies, there was similarity in the prevalence of depression. This could be due to the tools used are consistent or that having the same underlying condition predisposes patients to similar disabilities and psychosocial stressors.

The prevalence of depression in this study was lower than that done by Islāmābād *et al* (19) which showed a prevalence of 76.1% using the HDRS screening tool. This study had 69.3% male participants and a mean age of 48.43 ± 12.69 years. A study done by Bhatti *et al* (20) showed a prevalence of 83.8% using the HDRS screening tool. This study had 51.96% male participants and a mean age of 46.83 ± 17.65 years. The large variability in prevalence could be as a result of the study criteria, methodology and the use of different screening tools to diagnose depression.

The severity spectrum in our study varies from other studies done worldwide. A study done by Islāmābād *et al* (19) found 31.8% had mild depression, 13.6% had moderate depression and 30.7% had severe depression using the HDRS screening tool. This study had 69.3% male participants and a mean age of 48.43 ± 12.69 years. A study by Nelson *et al* (21) showed 28.1% had mild depression, 39.7% had moderate depression and 15.7% had severe depression using the BDI screening tool. This study population had 78% male participants and the mean age of 52.89 ± 11.02 years. This difference could be as a result of the study criteria, methodology and the use of different screening tools to diagnose depression.

A study by Islāmābād *et al* (19), found no correlation between age and one developing depression. A study by Sanathan *et al* (22) found that older individuals have higher depression rates. A study by Fischer *et al* (23), found that younger patients experience more depressive symptoms than older patients. Our results are consistent with the latter findings, that young patients (18 – 29 years) are more likely to suffer from depression as compared to older patients.

Education status can be postulated in addition to undergoing HD to contribute to a patient suffering from depression. In India ESRD patients undergoing HD who had low levels of education were shown to exhibit more depressive symptoms, several other studies have shown this relationship (21,24). In our study the findings corroborate these findings and demonstrate that patients with no level of formal education were more likely to suffer from depression as compared to patients who had any form of formal education. This could be explained by the fact that lack of education makes one not follow instructions

concerning their health i.e. poor dietary habits, lack of compliance to medication and poor health seeking behaviour.

The social economic status can be an important determinant of depression in patients undergoing HD, this in our study can be deduced from one's employment status. We know that ESRD brings a series of losses to the patient and requires some adaptation, including the difficulty of integration into the labour market, due to the physical condition caused by the disease and the dynamics of dialysis treatment. Other studies (23,25) reported a higher percentage of depressed patients among those who were unemployed and those without monthly income. In our study, there were more patients who were not involved in some productive economic activities, but no significant association was seen between this group of patients and development of depression. However, we observed a significant association between retirement and one developing depression. This could be explained by the loss of social links created during employment, decline in social status within the society after retirement, and a reduction in income. This aspect deserves to be better evaluated in future studies.

Turkish researchers carried out a study looking at the relationship between depression and perceived social support in ESRD patients undergoing HD. According to the study patients who had high social support were less likely to be diagnosed with depression (26). Many other studies carried out in different geographical locations and ethnic groups have established comparable results. Our results established that patients with high social support were less likely to develop depression as compared to those with moderate or low social support. Psychological issues in resource constrained setting are likely to be neglected especially in patients with ESRD undergoing HD. The knowledge that social support can have an impact on depression in patients undergoing HD presents an opportunity for early medical intervention. It would therefore be reasonable for the medical team involved in the care of this patients to recognise and stress upon the importance of social support. Physicians ought to identify patients with low social support, and offer alternative options (e.g. group therapy) to help improve the quality of life especially in patients on HD (27).

A study by Islāmābād *et al* (19), showed a relationship between gender and one developing depression in patients who were undergoing HD. In this study females were more likely to develop depression as compared to their male counterparts. Armaly *et al* (28), also demonstrated a similar pattern with females having more depression than males. The study we carried out showed no association between gender and depression.

Marital status can be an important predictor of depression in patients undergoing HD. A study done among HD patients showed being married conferred one with an even greater risk of developing depression (24). In contrast, a study done in India showed that participants who were single had more depressive symptoms than the rest of the participants (22). Our results do not demonstrate any association between one developing depression and their marital status. This variability may be explained by the fact that different cultures may have multiple sources of support and don't necessarily rely on the spouses.

Duration of dialysis has been researched as a determinant of depression in several studies and has shown conflicting results. A study, carried out in India by Sanathan *et al* (22) demonstrated that the first year after commencing HD was linked with a higher risk of developing depression. Our finding is in contrast to this studies, we did not establish any link between duration of dialysis and our participants developing depression. However, this link is still possible if screening of patients is done while commencing HD and then subsequently followed up over time.

A history of cardiovascular disease can be postulated in addition to undergoing HD to contribute to a patient suffering from depression, this can ultimately have an impact on once quality of life (23). Individually this medical conditions have been associated with one developing depression. Having multiple chronic illness is expected to put an undue socio economic burden on the patient. This multiplicity of issues could facilitate in the development of depression. However, this study did not demonstrate any significant association between having a history of cardiovascular disease and developing depression.

The status within a family set up of a patient diagnosed with ESRD undergoing HD may have an impact on one developing depression. This may be as a result of the financial implication involved in managing a chronic medical condition or self-reproach for not being able to meet the needs of the family, however our study failed to demonstrate any significant link with status within the family.

Despite the high incidence of depressive symptoms, only nine patients had ever been diagnosed with depression. This study highlights the extent of how under recognised depression is and hence the need for active screening for this disorder in ESRD patients undergoing HD. In our study about six patients who had ever been diagnosed with depression were ever put on treatment. A number of studies have looked at the use of antidepressant medication in patients diagnosed to have depression and undergoing HD and shown low

levels of compliance among patients; approximately between 10% and 50% (23,29-31). The low uptake to treatment may be as a result of misdiagnosis of depression in ESRD, concern about drug toxicity in the setting of reduced kidney function as well as drug to drug interaction due to the high pill burden, drug side effects, patient non adherence to treatment, and treatment with non pharmacological treatments such as psychotherapy (31,32). Several studies indicate that treatment with antidepressant, Sertraline for 3 months, not only reduced the symptoms but also improved the quality of life (33).

This study has some implications on health care service delivery in our set up. First, this study shows that depression is a common and substantial mental health problem which is often not diagnosed in ESRD patients undergoing HD. Therefore, it's important to include screening as part of the essential health package before initiating HD. The study also creates a platform for further studies exploring the predictors and mitigating factors in depression among ESRD undergoing HD.

This study had several limitations, we relied on a history of cardiovascular disease to obtain this particular predictor of depression in relation to ESRD patients undergoing HD. The analysis of the selected predictors is not definitive because they lack the statistical power, and hence are only exploratory in nature.

Conclusion

A high percentage of patients undergoing HD suffer from depression. The vast majority of this patients have mild depression. This study highlights the extent of how under recognised depression is and perhaps suggests the need for active screening for this disorder. The quality of life and clinical outcomes in patients diagnosed with ESRD undergoing HD can be greatly improved by early diagnosis and treatment.

Recommendations

- (i) We recommend routine screening of all ESRD patients for depression before commencement of HD using simple screening tools e.g. PHQ - 9 with appropriate referral.
- (ii) There is need of involving a multidisciplinary team in management of ESRD patients on HD. This could include the primary physician, psychologist and psychiatrist.
- (iii) There is need for research in areas revolving around mechanisms of depression and preventing and treating depression.

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