***Original Research Article***

**Depression and Chronic Kidney Disease: Risk Factors and Predictors in Nigerian Patients.**

**ABSTRACT:**

Background: Depression is the most common psychological illness among patients with chronic kidney disease. There have been conflicting opinions and reports regarding the risk factors and predictors contributing to it. Systematic review studies report chronic kidney disease (CKD) stages 4 and 5 as having the highest prevalence rates of 22.8% and 39% respectively. This study intends to add to the growing knowledge on the predictors and other associated factors.

Methods**:** Patients attending the renal clinic in a teaching hospital, who met the inclusion criteria were recruited into the study. Socio-demographic data was obtained by interviewer technique and Patients Health Questionnaire (PHQ-9) was used as the instrument for depression related data aimed at identifying factors that may be contributing to depression and possibly predictive.

Results:The patients were predominantly males, of low socio-economic class and had little or no financial support. Hypertension was the leading comorbidity. The mean depression score (PHQ-9) was7.10+ 5.202, with 126 (63.5%) having depressive symptoms, out of which 55 (43.7%) turned out with major depression PHQ >10. Nine variables showed significant association (p<.05) with depression, but on bivariate logistic regression, unemployment-AOR=7.279, 95%CI: 2.04-25.92, p=.001, Financial support-AOR=5.075, 95%CI: 1.02-3.25, p=.001, CKD stages 3-5, AOR=56.533, 95% CI: 3.61-885.22, p=.003, and feeling that life depends on pills- AOR=3.582, 95%CI: 1.40-9.14, turned out as predictive factors.

**Conclusion:**

Unemployment, no financial support, CKD stages 3-5 and patients feeling regarding the pills contribute significantly to clinical depression in CKD patients. Functional social support and routine screening of CKD patients for depression are strongly recommended.

Keywords: CKD, eGFR , Major depression, Predictors, PHQ-9.

1. **INTRODUCTION**

According to the world health organization (WHO) 2021, the global depression levels are in an estimated 3.8% of the population, which includes 50% of adults, 5.7% of seniors > 60yr.[1] Depression is the commonest mental health disorder associated with chronic diseases, including children, women and general population.[2] It is the most common psychological illness among patients with chronic kidney disease.[3] Recent studies have shown that patients with CKD who are not on dialysis have rates of depression up to 3 times higher than those in the general population.[4]

Depression is independently associated with increased risk of mortality in CKD patients,[5] and its effect on physical health accounts for the high frequency in hospital admissions, but the relatively high mortality seen in CKD may be due to its effect on mental health of patients.[6] CKD patients with major depression are reported to commit suicide more and die more prematurely than those without depression. [7]

In Nigeria, studies on the prevalence of depression have been conducted in patients with chronic diseases and general public. Gureje et, al 2008 reported a life time prevalence of 3.1% among people > 18yr. [8] Recent studies have reported prevalence rates of 17% to 34.8% from different regions and settings across the country. [9, 10,11, 12] These studies and many others have reported conflicting factors as predictive for clinical depression in CKD patients. Kimmel et. al, in attempt to tell us what we need to know about depression in patients with chronic renal disease, concluded that the relationship between most of the socio-demographic variables and depression and medical outcomes are yet to be determined in patients with renal diseases [13]

This study seeks to add to the growing body of knowledge, the risk factors that may predispose patients with CKD to depression in the predictive category using the PHQ-9 in a teaching hospital in Nigeria.

1. **METHODOLOGY**

This study was conducted at the nephrology unit of Rivers State University Teaching Hospital (RSUTH) Port Harcourt, Nigeria, between 1st February 2024 and to 30th September 2024. This unit serves as a referral center to the peripheral health facilities within the region. It attends to kidney diseases including hemodialysis and preparing patients for kidney transplant. The study involves predialysis CKD patients attending the renal clinic for more than 6 months.

Chronic kidney disease is a decrease in the renal creatinine filtration rate (estimated glomerular filtration rate –eGFR<60ml/min/1.73m2), lasting for 90 days [14] eGFR is used to determine the presence of CKD which is classified into 5 stages. Cock Coft Gaut (CG) formula is used to calculate the eGFR and the patients were assigned into different stages of CKD using KDIGO 2012. [15]

A convenient and practical sampling approach was used to recruit patients from the clinic and those who met the study inclusion criteria were invited to participate. The inclusion criteria required that patients be at least 18yrs, must have been attending clinic for at least 6 months. Uremic and confused patients and patients with history of mood disorders were excluded. Approval was obtained from all relevant authorities and informed consent received from all the participants. The patients were briefed and educated on the project and were supervised to fill the two questionnaires used for the study.

The first questionnaire contained the socio-demographic variables and relevant medical history. The second was the PHQ-9, commonly used to screen for depression in patients with CKD and end stage kidney disease (ESKD) with high validity. [16] It has been used across the African continent and its validity established in Nigerian cohort. [17] It is a reliable and valid measure of depression severity, with a sensitivity of 54% and specificity of 90% for scores > 10. [18] The PHQ scores (0-3) were added up for each patient to get a total score (0-27) which was used to classify patients into the level of depression, using ranges from the data code. A total of 224 patients were recruited, 24 (10.7%) were excluded resulting in a convenient sample size of 200 fig 1.

|  |
| --- |
|  224 participants recruited |

20 were excluded:

6 were confused

8 –No recent creatinine values

6-Did not sign consent form

204 participated

4 were excluded due to incomplete questionnaire

200 were included in the final analysis

**Fig 1. Flow diagram for participants’ selection.**

**Data Analysis**

Microsoft excel 10 was used to create a data base. Statistical analysis was done using statistical package for social sciences SPSS-25. Descriptive statistical analysis for collected data was reported either as means or proportions. Associations between means of continuous variables were determined using student T-test or chi-square test used as appropriate for discrete variables. Bivariate logistic regression analysis was used to determine predictors significant at a p value<.05.

1. **RESULTS**

A total of 200 participants completed the face to face interview. Table 1 shows the distribution of socio-demographic characteristics, while table 2 shows the relevant medical history of participants.

**Table1:** Baseline characteristics of patients showing socio-demographic variables.

|  |  |  |
| --- | --- | --- |
| **VARIABLE** | **Frequency (n)** | **Percentage (%)** |
| **Age** | ≤ 44 years | 68 | 34.0 |
| 45 - 64 years | 66 | 33.0 |
| ≥ 65 years | 66 | 33.0 |
|   |  |  |
|   |   |   |   |
| **Gender** | Male | 115 | 57.5 |
| Female | 85 | 42.5 |
|   |   |   |   |
| **Marital Status** | Single | 54 | 27.0 |
| Married | 124 | 62.0 |
| Widowed  | 18 |  9.0 |
| Separated | 4 |  2.0 |
|   |   |   |   |
| **Educational Level** |  |  |  |
| Primary | 16 |  8.0 |
| Secondary | 88 | 44.0 |
| Tertiary | 96 | 48.0 |
|   |   |   |   |
| **Employment Status** | Employed | 98 | 49.0 |
| Unemployed | 50 | 25.0 |
| Retired | 52 | 26.0 |
|   |   |   |   |
| **Economic status****(Income per month)** | <₦30,000 | 82 | 41.0 |
|   | ₦31,000-100,000 | 88 | 44.0 |
|   | >₦100,000 | 30 | 15.0 |
|  |  |  |  |
| **Financial support** | Family/friends  | 134 | 67.0 |
|  | Community/NGO | 2 |  1.0 |
|  | Government/ Insurance | 4 |  2.0 |
|  | None  | 60 | 30.0 |

NGO- Non Governmental Organizations

**Table 2:** Clinical characteristics of participants

|  |  |  |
| --- | --- | --- |
| **VARIABLE** | **Frequency (n)** | **Percentage (%)** |
| **Duration of CKD** | <5years | 164 | 82.0 |
| 6-10 years |  32 | 16.0 |
| >10 years |  4 |  2.0 |
|   |  |  |
|   |   |   |   |
| **CKD Stages** | Stage 1 | 10 |  5.0 |
| Stage 2 | 70 |  35.0 |
|  Stage 3 |  50 25.0 |
|  Stage 4 |  48 24.0 |
|  Stage 5 |  22 11.0 |
|  |
|  |  |  |  |
| **Comorbidities**  | Diabetes mellitus |  30 | 15.0 |
| Hypertension  | 124 | 62.0 |
| CIN |  2 |  1.0 |
| SCD |  10 |  5.0 |
|   |  |  |  |
|  | >2 comorbidities  |  28  | 14.0 |
| **Medication dependence**  | Others  |  6 |    3.0 |
| Yes |  80 | 40.0  |
| No | 120 | 60.0 |
|  |  |  |
|   |   |   |   |
| **Drug availability** | Regularly  | 124 | 62.0 |
| Occasionally  |  58 | 29.0 |
| Rarely  |  18 |  9.0 |
|   |   |   |   |

CKD- Chronic kidney disease, CIN- Chronic interstitial nephritis, SCD- Sickle cell disease

The patients were predominantly males (57.5%), married 62%, with tertiary education (48%), and hypertension was the commonest comorbidity. The prevalence of stage 1 CKD was 5% (n=10) and stage 5 was 11% (n=22).

Depression was significantly common in the group with primary level of education 12(75%), secondary level 64(72%) and tertiary 50(52%). Patients with tertiary education had the least risk (OR=.362 p=.518). Among the unemployed group, 38 (76%) had depression, while 34(65.4%) of the retirees had some form of depression. The adjusted odd of having depression among the unemployed was predictively significant AOR=7.279, 95%CI: 2.04-25.92, p=.001.

Among the group that earned monthly wages, depression was identified in 60(47.6%) of the low income group of N30,000 monthly wage and this difference was significant p=.02. Participants without any form of financial support, 52(86.6%) were observed to have the highest risk of depression compared with those with some sort of support AOR=5.075, 95%CI: 1.02-3.25, p=.001.

Participants with longer duration of CKD were significantly associated with developing depression p=.02. In respect of the various CKD stages, participants categorized as stage 2, were less likely to develop depression compared with more advanced stages as 5, OR=AOR=56.533, 95%CL3.61-885.22, p=.003. figure 2 shows the frequency distribution of depression among the various stages of CKD.

Fig 2: Frequency of depression among the CKD stages (n=126)

Majority of the participants who had depressive symptoms had hypertension as an existing comorbidity (58.7%), all the participants with sickle cell disease were observed to be depressed. A significant difference (p=.02) was observed in patience with more than one comorbidity. Participants who felt they were medication dependent were twice as likely to be depressed as those who did not feel so, AOR=3.582, 95%CI: 1.40-9.14, p=.009. Meanwhile, gender, age, marital status, alcohol and cigarette intake, quantity of pills used daily and availability of medication did not show significant association with depression as depicted in table 3.

**Table 3:** Factors associated with depression among Pre-dialysis CKD patients.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | Participants with depression (n=126) | Participants without depression n =74) | X2 | p –value |
| **Gender** |  |  |  |  |
| Female  | 51(40.5%) | 34(45.9%) | 0.57 | 0.45 |
| Male  | 75(59.5%) | 40(54.1%) |  |  |
| **Age** |  |  |  |  |
| 18-44 | 40(31.8%) | 28(37.9%) | 0.90 | 0.64 |
| 45-59 | 44(34.9%) | 22(29.7%) |  |  |
| >60 | 42(33.3%) | 24(32.4%) |  |  |
| **Marital status** |  |  |  |  |
| Married | 72(57.1%) | 52(70.3%) | 5.01 | 0.17 |
| Single  | 38(30.2%) | 16(21.6%) |  |  |
| Separated | 4(3.2%) | 0(0%) |  |  |
| Widowed | 12(9.5%) | 6(8.1%) |  |  |
| **Educational status** |  |  |  |  |
| Primary | 12(9.5%) | 4(5.4%) | 9.67 | 0.01\* |
| Secondary | 64(50.8%) | 24(32.4%) |  |  |
| Tertiary  | 50(39.7%) | 46(62.2%) |  |  |
| **Employment**  |  |  |  |  |
| Employed  | 54(42.8%) | 44(59.5%) | 6.37 | 0.041\* |
| Unemployed  | 38(30.2%) | 12(16.2%) |  |  |
| Retired  | 34(27.0%) | 18(24.3%) |  |  |
| **Economic status** |  |  |  |  |
| < N30000 | 60(47.6%) | 22(29.7%) | 8.16 | 0.02\* |
| 31-N100000 | 46(36.5%) | 42(56.8%) |  |  |
| >N100000 | 20(15.9%) | 10(13.5%) |  |  |
| **Financial support** |  |  |  |  |
| Family /friend | 70(55.5%) | 64(86.5%) | 22.5 | 0.01\* |
| Community/NGO | 2(1.6%) | 0(0%) |  |  |
| Govt,/insurance | 2(1.6%) | 2(2.7%) |  |  |
| None  | 52(41.3%) | 8(10.8%) |  |  |
| **Drink alcohol** |  |  |  |  |
| Yes  | 16(12.7%) | 8(10.8%) | 0.16 | 0.69 |
| No  | 110(87.3%) | 66(89.2%) |  |  |
| **Smoke cigarette**  |  |  |  |  |
| Yes  | 4(3.2%) | 2(2.7%) | 0.36 | 0.85 |
| No  | 122(96.8%) | 72(97.3%) |  |  |
| **Duration of CKD** |  |  |  |  |
| <5yr | 96(76.2%) | 68(91.9%) | 8.32 | 0.02\* |
| 6-10yr | 26(20.6%) | 6(8.1%) |  |  |
| >10yr | 4(3.2%) | 0(0%) |  |  |
| **CKD stages** |  |  |  |  |
| Stage 1 | 2(1.6%) | 8(10.8%) | 21.38 | 0.00\* |
| Stage 2 | 36(28.6%) | 34(45.9%) |  |  |
| Stage 3 | 32(25.4%) | 18(24.3%) |  |  |
| Stage 4 | 40(31.7%) | 8(10.8%) |  |  |
| Stage 5 | 16(12.7%) | 6(8.1%) |  |  |
| **Comorbidity**  |  |  |  |  |
| Hypertension | 74(58.7%) | 50(67.6%) | 13.15 | 0.02\* |
| Diabetes mellitus | 20(15.9%) | 10(13.5%) |  |  |
| CIN | 0(0%) | 2(2.7%) |  |  |
| SCD | 10(7.9%) | 0(0%) |  |  |
| >2 comorbidities | 22(17.5%) | 12(16.2%) |  |  |
| **Medication dependence** |  |  |  |  |
| Yes | 60(47.6%) | 20(27%) | 8.23 | 0.004\* |
| No  | 66(52.4%) | 54(73%) |  |  |

CKD- Chronic kidney disease, CIN- Chronic interstitial nephritis, SCD- Sickle cell disease, \* Significant.

A total of 126 patients (63%) showed depressive symptoms, out of which 71 (56.3%) had mild depression, 32 (25.4%) moderate, 21 (16.7%) moderate to severe, 2 (1.6%) had severe depression using the depression severity scale in PHQ-9. Among the 126 with depressive symptoms, 55 (43.7%) had major depression (PHQ score > 10). Fig 3 shows the distribution of the severity of depression among the CKD stages and table 4 shows the predictors of depression severity.

 Stage 1(n=2) stage 2(n=36) stage 3(n=32) stage 4(n=40) stage 5(n=16)

Fig 3: Depression Severity according to the CKD stages (n=126)

**Table 4: Predictors of depression severity**

Variables AOR P-values 95%CI for AOR

Unemployment 7.279 .001 2.04-25.92

No financial support 5.075 .001 1.02-3.25

CDK stage 3 24,401 .006 2.71-217.28

CKD stage 4 24.094 .005 2.57-225.97

CKD stage 5 56.533 .003 3.61-885.22

Life depends on pills 3.582 .009 1.40-9.14.

1. **DISCUSSION**

This study has highlighted the factors that turned out very significant and predictive in depression among CKD patients in a teaching hospital setting using PHQ-9. These factors included the variables of unemployment, no financial support, CKD stages and feeling of life depends on pills.

Bahall et, al [19] in a similar study, reported 62.1% prevalence of major depression with 45.1%, 12.4% and 4.6% as having moderate, moderate to severe and severe depression respectively. The difference being that their sample comprised of stages 3-5 CKD and they reported level of education as predictive OR- 33.261, 95%CI:6.211-178.130, p=.001. Contrary to our finding, education showed some level of significance but was not predictive on bivariate and multiple logistic regression OR=0.889, 95%CI: 0.26-3.03, p=.931.

Our findings show close similarity to other studies that reported strong associations between socio-demographic variables such as employment, [20] economic status, [21] and financial support. [22] Patients of low economic status who earned <N30000 which is the minimum monthly wage in Nigeria, were observed to have high depressive scores as those with no employment.

Adesokun et.al [12], in an earlier study in Nigeria, reported low income p=.015, as predictive of major depression. Our study reports a strong association between unemployment and depression AOR= 7.279, 95%CI: 2.04-25.92, p=.001. A good and effective support system especially financial support, is a major contributor to patients security, quality of life, and prognosis. [23] Lack of financial support for health related issues in countries such as Nigeria, impacts gravely on the patients. Our study shows that patients who had no financial support were more likely to develop depression p=.001. The majority of patients who rarely could afford the drug were also more likely to be depressed p=.046.

Our reports on gender, patient’s age, and marital status are in keeping with other studies such as that of Kimmel et. al, but at variance with that of Osunbor et. al who reported that being single was predictive of depression p= .002, and Mosleh et. al where age group was the only predictive factor.

In keeping with our finding that the longer the duration of CKD, the stronger the association with depression, Hulder et.al [24] reported a strong association p=.044, Osumbo et. al p=.026. We assessed all stages of CKD, stages 1 and 2 were less likely to be depressed as was also reported by Osumbo et.al [10] OR=3.81, p=.01, and Haffarachi et.al. [25] Bahall et.al [19] also reported that severe depression increased with worsening CKD stages 3-5 which is in keeping with our finding. In this report, CKD stage 5 displayed the highest prevalence of clinical depression AOR=53.53, 95%CI: 3.61-885.22, p=.003, with 37.5% of them having moderate to severe depression. This is in keeping with an earlier report by Mosleh et.al [26] in Saudi Arabia, while Shirazian 2019, [27] Amira et.al [11], Azegbeobor et.al [9] reported no association between CKD stages and depression.

This study reports a high level of depression 63% PHQ> 5 and 43.7% major depression PHQ score >10. A prevalence of 43.7% major depression as a comorbidity to CKD predialysis patients is deleterious and grave to the patients, confirming the finding by Hadayati et.al [6]. This is not surprising considering the high unemployment rate, poor standard of living, poor income, lack of financial support and absence of functional health insurance coverage in Nigeria. These poor prognostic features worsen CKD and it’s comorbidity leading to daily use of more pills, making the patients believe their lives depend on pills as reported by this study AOR= 3.582 95% CI: 1.40-9.14.

1. **CONCLUSION**

Absence of financial support such as health insurance schemes, high rate of unemployment in Nigeria, stages 3-5 of CKD and the feeling that life depends on pills by the patients, have been highlighted as predictive factors leading to major depression in CKD patients in Nigeria. These factors along with others as reported, accounted for the high prevalence rate of major depression in these patients and this contributes greatly to the high mortality earlier reported. Patients with CKD at all stages should be screened for depression as a routine check and a functional social support system is strongly recommended.

**Study Limitations**

Clinical evaluation of depression using PHQ-9 scores is usually subjective and may influence the expected outcome. Structured instruments may be more accurate.

**Ethical approval and consent**

Written and informed consent was obtained from all participants and research approval obtained from all relevant authorities.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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