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Original Article

Depressive Symptoms and Treatment Adherence in Patients With Chronic Heart Failure Managed in Internal Medicine Clinics: Cross-Sectional Study

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ABSTRACT

Background: Chronic heart failure requires sustained medication use, dietary self-care, and regular follow-up, but depressive symptoms may interfere with these behaviors and remain underrecognized in routine outpatient care. Objective: To assess the prevalence of depressive symptoms among patients with chronic heart failure attending internal medicine clinics and evaluate their association with treatment adherence. Methods: This cross-sectional observational study included 180 adult patients with chronic heart failure attending selected tertiary care hospitals in Rawalpindi, Pakistan. Depressive symptoms were assessed using the Patient Health Questionnaire-9, with a score of ≥10 defining clinically significant depressive symptoms. Treatment adherence was evaluated across medication compliance, dietary adherence, and clinic follow-up domains. Associations were assessed using chi-square testing, and odds ratios with 95% confidence intervals were calculated. Results: Clinically significant depressive symptoms were present in 76 patients (42.2%). Poor adherence was most frequent for dietary recommendations (51.1%), followed by medication compliance (42.2%) and clinic follow-up (32.8%). Patients with depressive symptoms had higher odds of poor medication adherence (OR 4.65, 95% CI 2.46–8.79; p<0.001), poor dietary adherence (OR 5.29, 95% CI 2.76–10.14; p<0.001), and poor clinic follow-up (OR 1.87, 95% CI 1.00–3.51; p=0.047). Poor adherence increased progressively with greater depressive symptom severity. Conclusion: Depressive symptoms were common and significantly associated with poorer treatment adherence among patients with chronic heart failure, particularly for dietary and medication-related self-care. Routine depressive symptom screening and integrated psychosocial support may improve outpatient heart failure management. Keywords: chronic heart failure; depressive symptoms; treatment adherence; medication compliance; dietary adherence; clinic follow-up; PHQ-9; internal medicine clinics; Pakistan.

INTRODUCTION

Chronic heart failure is a progressive clinical syndrome associated with persistent symptom burden, functional limitation, repeated healthcare utilization, and long-term dependence on pharmacological and self-care-based management. Effective care requires patients to maintain regular medication use, follow dietary and fluid-related recommendations, monitor symptoms, and attend scheduled follow-up visits. Although these behaviors are central to preventing decompensation and avoidable hospitalization, adherence remains difficult for many patients because heart failure management is continuous,

multidimensional, and strongly influenced by cognitive, emotional, socioeconomic, and health-system factors (1).

Depressive symptoms are among the most frequent psychological comorbidities in patients with chronic heart failure and may include low mood, anhedonia, fatigue, impaired concentration, sleep disturbance, hopelessness, and reduced motivation. These symptoms can overlap with the physical manifestations of heart failure, making depression difficult to recognize during routine medical consultations. Evidence from heart failure populations indicates that depression is not merely a psychological response to chronic illness but is associated with poorer quality of life, higher symptom burden, increased hospitalization risk, and adverse survival outcomes (2,3). In low- and middle-income settings, where outpatient clinics are often busy and mental health screening is not routinely integrated into chronic disease care, depressive symptoms may remain underdiagnosed despite their clinical relevance (4).

One plausible pathway through which depressive symptoms may worsen heart failure outcomes is reduced treatment adherence. Patients with depression may have lower energy, impaired memory, reduced self-efficacy, limited motivation, and diminished confidence in managing long-term treatment. These factors can interfere with taking prescribed medicines, following salt and fluid restriction, and attending follow-up visits. Previous studies have shown that depressive symptoms are associated with poorer medication adherence and weaker self-care behaviors in heart failure patients, suggesting that adherence should be understood not only as a knowledge-based behavior but also as a psychologically mediated clinical outcome (5,6).

Medication adherence is particularly important in chronic heart failure because evidence-based therapies reduce symptoms, hospitalization, and mortality when taken consistently. However, patients are often prescribed multiple drugs, including diuretics, beta-blockers, renin–angiotensin system inhibitors, angiotensin receptor–neprilysin inhibitors, mineralocorticoid receptor antagonists, and other supportive medications. Polypharmacy, side effects, financial constraints, limited understanding of treatment benefits, and depressive symptoms may all reduce adherence. Meta-analytic evidence has shown that interventions improving medication adherence can improve heart failure outcomes, reinforcing the importance of identifying modifiable barriers to adherence in routine clinical care (7,8).

Dietary adherence is another essential but challenging component of heart failure self-management. Salt restriction, fluid awareness, and dietary modification require sustained behavioral effort and often depend on family support, food availability, cultural dietary practices, and patient literacy. In settings such as Pakistan, shared household meals, high-salt dietary patterns, financial limitations, and variable counseling quality may make dietary adherence especially difficult. Depressive symptoms may further weaken dietary self-care by reducing planning ability, motivation, and perceived control over illness management. Recent literature has emphasized that psychological factors are closely related to self-care behaviors in heart failure, including dietary practices and symptom management (9).

Regular clinic follow-up is also necessary for monitoring symptoms, adjusting medication doses, identifying complications, and reinforcing self-care behaviors. Missed follow-up visits may delay clinical assessment and contribute to preventable deterioration. Unlike medication and diet, however, follow-up adherence may be influenced by broader contextual barriers such as transportation, cost, family support, physical frailty, and access to tertiary care. Depressive symptoms may contribute to missed appointments through social withdrawal, hopelessness, fatigue, and reduced perceived need for care, but this relationship may be weaker or more context-dependent than medication or dietary adherence (10).

The Patient Health Questionnaire-9 is a brief, practical, and widely used screening tool for depressive symptoms in clinical and research settings. It provides both a symptom severity score and a clinically meaningful threshold for identifying probable depression, making it suitable for outpatient settings where time and resources are limited (11). The availability of Urdu-language validation in cardiac populations further supports its use among Pakistani patients, particularly in tertiary care clinics where

a simple screening approach may help identify patients at risk of poor self-management and non-adherence (12).

Despite growing evidence linking depression with adverse outcomes in heart failure, limited local data are available on how depressive symptoms relate to specific adherence domains among patients managed in internal medicine outpatient clinics in Pakistan. Most routine clinical encounters focus on physical symptoms, medication prescriptions, and comorbidity management, while emotional barriers to adherence may not be systematically assessed. This creates an important knowledge gap, particularly in tertiary hospitals where patients often have advanced disease, multiple comorbidities, repeated visits, and substantial treatment burden.

Therefore, this study was designed to assess the prevalence of depressive symptoms among adult patients with chronic heart failure attending internal medicine clinics in selected tertiary care hospitals of Rawalpindi, Pakistan, and to evaluate their association with treatment adherence across three clinically relevant domains: medication compliance, dietary adherence, and clinic follow-up. The study was guided by the hypothesis that patients with clinically significant depressive symptoms would have poorer adherence to heart failure treatment than patients without clinically significant depressive symptoms.

MATERIALS AND METHODS

This cross-sectional observational study was conducted among adult patients with chronic heart failure attending internal medicine outpatient clinics at selected tertiary care hospitals in Rawalpindi, Pakistan. A cross-sectional design was selected because the study aimed to estimate the burden of depressive symptoms and examine their association with treatment adherence at a single point in routine clinical care. The study population comprised patients with an established diagnosis of chronic heart failure who were receiving outpatient follow-up and long-term medical management in internal medicine clinics.

Eligible participants were adults aged 18 years or above with a confirmed diagnosis of chronic heart failure for at least three months, who were able to communicate in Urdu or English and provided informed consent for participation. Patients were excluded if they were critically ill at the time of assessment, had acute medical instability, had severe cognitive impairment interfering with reliable interview responses, had a known psychotic disorder, or were otherwise unable to complete the questionnaire appropriately. Participants were selected using a non-probability consecutive sampling technique, whereby all eligible patients presenting to the selected outpatient clinics during the recruitment period were approached sequentially and invited to participate until the required sample size was achieved.

The sample size was calculated using the standard single-population proportion formula for cross-sectional studies, based on an expected prevalence of depressive symptoms among patients with chronic heart failure, a 95% confidence level, and a 5% margin of error. The calculated sample was increased to account for possible incomplete responses and to improve the reliability of estimates. The final sample included 180 patients. Recruitment was carried out during routine follow-up visits. Patients who met the eligibility criteria were informed about the study purpose, procedures, voluntary nature of participation, confidentiality protections, and their right to decline without any effect on their clinical care. Written informed consent was obtained before data collection.

Data were collected through a structured interviewer-administered questionnaire. The questionnaire was designed to capture sociodemographic characteristics, clinical profile, depressive symptoms, and treatment adherence. Sociodemographic variables included age, gender, marital status, education level, occupation, residence, and monthly family income. Clinical variables included duration of heart failure, comorbid conditions such as hypertension, diabetes mellitus, and ischemic heart disease, number of prescribed medicines, smoking status, previous hospital admissions, and pattern of clinic follow-up.

Patient-reported information was supplemented, where available, by review of medical records to improve accuracy of clinical variables.

Depressive symptoms were assessed using the Patient Health Questionnaire-9. The PHQ-9 consists of nine items assessing depressive symptoms experienced during the preceding two weeks, with each item scored from 0 to 3 according to symptom frequency. Total scores range from 0 to 27, with higher scores indicating greater depressive symptom severity. Scores were categorized as minimal, mild, moderate, moderately severe, and severe depressive symptoms. A PHQ-9 score of 10 or higher was used to define clinically significant depressive symptoms for the primary analysis. The Urdu or English version of the questionnaire was administered according to participant preference, and items were explained in simple language when needed to ensure comprehension (11,12).

Treatment adherence was assessed across three clinically relevant domains: medication compliance, dietary adherence, and clinic follow-up adherence. Medication compliance was evaluated by asking participants about regular use of prescribed heart failure medicines, missed doses, forgetfulness, and intentional non-use of medication. Dietary adherence was assessed through questions related to compliance with physician-advised salt restriction, fluid restriction where applicable, and general dietary precautions for heart failure. Clinic follow-up adherence was assessed by determining whether patients attended scheduled outpatient appointments regularly or missed follow-up visits without medical advice. Responses in each adherence domain were classified into good or poor adherence according to predefined domain-specific scoring criteria, allowing separate analysis of medication, dietary, and follow-up behaviors.

The primary exposure variable was clinically significant depressive symptoms, defined as PHQ-9 score ≥10. The primary outcome variables were poor medication adherence, poor dietary adherence, and poor clinic follow-up adherence. Depression severity category was also analyzed as an ordinal exposure to examine whether poorer adherence increased with worsening depressive symptom burden. Potential confounding variables included age, gender, education level, duration of heart failure, comorbidities, number of prescribed medications, previous hospital admissions, and socioeconomic indicators. These variables were selected because of their plausible relationship with both depressive symptoms and treatment adherence.

Before the main data collection, the questionnaire was pretested among a small group of patients from a similar clinical setting who were not included in the final analysis. Pretesting was performed to assess clarity, cultural appropriateness, sequence of questions, and feasibility of administration in an outpatient clinic environment. Minor wording refinements were made to improve participant understanding. Data collectors were oriented regarding standardized interviewing procedures, neutral question delivery, confidentiality, and avoidance of leading prompts. Interviews were conducted in a calm area of the clinic to protect privacy and encourage honest responses, particularly for questions related to mood and adherence behavior.

Several measures were used to reduce bias and improve data quality. Consecutive sampling was used to reduce selective recruitment of patients. A uniform questionnaire and standardized interview approach were applied to all participants. Medical terms were explained consistently in nontechnical language. Clinical information was cross-checked with available records when possible. Completed questionnaires were reviewed daily for completeness and internal consistency before data entry. Data were entered into SPSS version 25, and entries were checked for coding errors, missing values, and logical inconsistencies prior to analysis.

Descriptive statistics were used to summarize participant characteristics and study variables. Categorical variables were presented as frequencies and percentages, while continuous variables such as age and duration of illness were summarized using means and standard deviations where normally distributed. The prevalence of clinically significant depressive symptoms was calculated as the proportion of

participants with PHQ-9 score ≥10. Treatment adherence was described separately for medication compliance, dietary adherence, and clinic follow-up adherence. The chi-square test was used to assess associations between depressive symptoms and categorical adherence outcomes. Where expected cell counts were small, Fisher's exact test was considered. Crude odds ratios with 95% confidence intervals were calculated to quantify the strength of association between clinically significant depressive symptoms and poor adherence in each domain.

To account for potential confounding, multivariable binary logistic regression was planned for each adherence outcome, with poor medication adherence, poor dietary adherence, and poor clinic follow-up adherence entered separately as dependent variables. Clinically significant depressive symptoms were included as the main independent variable, while relevant sociodemographic and clinical covariates were entered as adjustment variables based on clinical plausibility and bivariate associations. Depression severity categories were additionally examined to assess whether increasing PHQ-9 severity was associated with progressively poorer adherence. A p-value of less than 0.05 was considered statistically significant for inferential analyses. Complete-case analysis was used for variables required in each statistical model.

Ethical approval was obtained from the relevant institutional ethical review committee before initiation of the study, and administrative permission was obtained from the selected tertiary care hospitals. All participants provided written informed consent. Confidentiality was maintained throughout data collection, entry, analysis, and reporting. No personal identifiers were included in the final dataset. Participants retained the right to withdraw from the study at any stage without any effect on their treatment. Data were stored securely and accessed only by the research team for study-related purposes.

RESULTS

A total of 180 patients with chronic heart failure were included in the analysis. The mean age of the participants was 58.9 ± 12.6 years, with ages ranging from 31 to 84 years. Most participants were aged 50 years or above, with the largest age group being 60–69 years, comprising 55 patients (30.6%), followed by 50–59 years with 49 patients (27.2%). Male participants accounted for 108 patients (60.0%), while 72 patients (40.0%) were female. Most participants were married, representing 142 patients (78.9%). Regarding educational status, 54 participants (30.0%) had no formal education, 61 (33.9%) had primary-to-middle education, and 65 (36.1%) had secondary-level education or above. Hypertension was the most common comorbidity, present in 119 patients (66.1%), followed by diabetes mellitus in 82 patients (45.6%) and ischemic heart disease in 74 patients (41.1%). Duration of heart failure was most commonly between 1 and 5 years, reported by 91 patients (50.6%), while 55 patients (30.6%) had heart failure for more than 5 years.

Table 1. Sociodemographic and clinical characteristics of patients with chronic heart failure

Variable	Frequency (n)	Percentage (%)
Age group, years		
30–39	12	6.7
40–49	28	15.6
50–59	49	27.2
60–69	55	30.6
≥70	36	20.0
Gender		
Male	108	60.0
Female	72	40.0
Marital status		
Married	142	78.9
Unmarried/widowed/separated	38	21.1
Education level		
No formal education	54	30.0
Primary to middle	61	33.9
Secondary and above	65	36.1
Comorbid condition		
Hypertension	119	66.1

Variable	Frequency (n)	Percentage (%)
Diabetes mellitus	82	45.6
Ischemic heart disease	74	41.1
Duration of heart failure		
<1 year	34	18.9
1–5 years	91	50.6
>5 years	55	30.6

Depressive symptom severity was assessed using the PHQ-9. Minimal symptoms were observed in 46 patients (25.6%), while mild symptoms were present in 58 patients (32.2%). Moderate depressive symptoms were found in 44 patients (24.4%), moderately severe symptoms in 22 patients (12.2%), and severe symptoms in 10 patients (5.6%). Using a PHQ-9 score of 10 or above as the threshold for clinically significant depressive symptoms, 76 patients (42.2%) were classified as having depressive symptoms, while 104 patients (57.8%) did not meet this threshold.

Table 2. Distribution of depressive symptom severity according to PHQ-9 category

PHQ-9 category	Frequency (n)	Percentage (%)	Clinically significant depressive symptoms
Minimal	46	25.6	No
Mild	58	32.2	No
Moderate	44	24.4	Yes
Moderately severe	22	12.2	Yes
Severe	10	5.6	Yes
Total	180	100.0	
PHQ-9 ≥10	76	42.2	Yes
PHQ-9 <10	104	57.8	No

Treatment adherence was assessed across three domains: medication compliance, dietary adherence, and clinic follow-up. Medication adherence was good in 104 patients (57.8%) and poor in 76 patients (42.2%). Dietary adherence showed the weakest pattern, with only 88 patients (48.9%) reporting good adherence and 92 patients (51.1%) classified as having poor adherence. Clinic follow-up adherence was comparatively better, with 121 patients (67.2%) attending follow-up regularly, while 59 patients (32.8%) had poor follow-up adherence. Overall, dietary non-adherence was the most frequent adherence problem, exceeding poor medication adherence by 8.9 percentage points and poor follow-up adherence by 18.3 percentage points.

Table 3. Treatment adherence patterns among patients with chronic heart failure

Adherence domain	Good adherence, n (%)	Poor adherence, n (%)	Total
Medication compliance	104 (57.8)	76 (42.2)	180
Dietary adherence	88 (48.9)	92 (51.1)	180
Clinic follow-up	121 (67.2)	59 (32.8)	180

The association between clinically significant depressive symptoms and treatment adherence is shown in Table 4. Poor medication adherence was observed in 48 of 76 patients (63.2%) with depressive symptoms compared with 28 of 104 patients (26.9%) without depressive symptoms. Patients with depressive symptoms had approximately 4.65 times higher odds of poor medication adherence than those without depressive symptoms (OR 4.65, 95% CI 2.46–8.79; $p < 0.001$). Poor dietary adherence was also substantially more frequent among patients with depressive symptoms, occurring in 56 patients (73.7%) compared with 36 patients (34.6%) without depressive symptoms. The odds of poor dietary adherence were approximately 5.29 times higher among patients with depressive symptoms (OR 5.29, 95% CI 2.76–10.14; $p < 0.001$). Poor clinic follow-up was reported in 31 patients (40.8%) with depressive symptoms and 28 patients (26.9%) without depressive symptoms, corresponding to an OR of 1.87 (95% CI 1.00–3.51; $p = 0.047$).

Table 4. Association between clinically significant depressive symptoms and poor treatment adherence

Adherence outcome	Depressive symptoms present, n/N (%)	Depressive symptoms absent, n/N (%)	Odds ratio (95% CI)	χ^2	p-value
Poor medication adherence	48/76 (63.2)	28/104 (26.9)	4.65 (2.46–8.79)	22.41	<0.001
Poor dietary adherence	56/76 (73.7)	36/104 (34.6)	5.29 (2.76–10.14)	27.18	<0.001
Poor clinic follow-up	31/76 (40.8)	28/104 (26.9)	1.87 (1.00–3.51)	3.95	0.047

A progressive increase in poor adherence was observed across increasing PHQ-9 severity categories. Poor medication adherence increased from 8 of 46 patients (17.4%) in the minimal symptom group to 8 of 10 patients (80.0%) in the severe symptom group. Poor dietary adherence showed the steepest gradient, rising from 11 patients (23.9%) in the minimal category to 9 patients (90.0%) in the severe category. Poor clinic follow-up also increased with depressive symptom severity, from 9 patients (19.6%) in the minimal group to 9 patients (90.0%) in the severe group. The overall association between PHQ-9 severity category and poor adherence was statistically significant for medication adherence ($\chi^2 = 30.03$, $p < 0.001$), dietary adherence ($\chi^2 = 34.86$, $p < 0.001$), and clinic follow-up adherence ($\chi^2 = 23.69$, $p < 0.001$). Trend analysis also demonstrated a significant stepwise increase in poor adherence with greater depressive symptom severity across all three adherence domains.

Table 5. Poor adherence according to depressive symptom severity

PHQ-9 category	Total n	Poor medication adherence, n (%)	Poor dietary adherence, n (%)	Poor clinic follow-up, n (%)
Minimal	46	8 (17.4)	11 (23.9)	9 (19.6)
Mild	58	20 (34.5)	25 (43.1)	14 (24.1)
Moderate	44	24 (54.5)	28 (63.6)	16 (36.4)
Moderately severe	22	16 (72.7)	19 (86.4)	11 (50.0)
Severe	10	8 (80.0)	9 (90.0)	9 (90.0)
χ^2 across categories		30.03	34.86	23.69
p-value		<0.001	<0.001	<0.001
Trend p-value		<0.001	<0.001	<0.001

Overall, the results showed that depressive symptoms were common among patients with chronic heart failure, affecting 42.2% of the study population. Adherence problems were also frequent, particularly for dietary adherence, where more than half of participants were classified as poorly adherent. Patients with clinically significant depressive symptoms had markedly higher rates of poor medication adherence and poor dietary adherence, with odds ratios exceeding four and five, respectively. A severity-dependent pattern was also evident, as poor adherence became progressively more common from minimal to severe depressive symptom categories across all adherence domains.

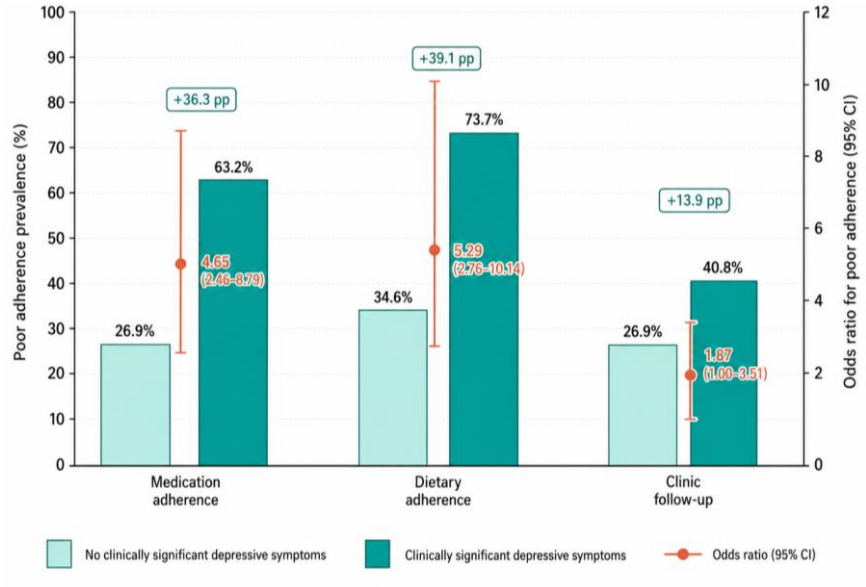

Figure 1. Depressive Symptoms and Domain-Specific Burden of Poor Treatment Adherence in Patients With Chronic Heart Failure

Figure Description: Patients with clinically significant depressive symptoms showed consistently higher poor adherence across all treatment domains compared with those without clinically significant depressive symptoms. Poor medication adherence was 63.2% versus 26.9%, poor dietary adherence was 73.7% versus 34.6%, and poor clinic follow-up was 40.8% versus 26.9%, corresponding to absolute differences of 36.3, 39.1, and 13.9 percentage points, respectively. The strongest associations were observed for dietary adherence (OR 5.29, 95% CI 2.76–10.14) and medication adherence (OR 4.65, 95%

CI 2.46–8.79), while clinic follow-up showed a smaller association (OR 1.87, 95% CI 1.00–3.51). Overall, the figure demonstrates a clinically meaningful gradient in which depressive symptoms are associated with a greater burden of poor treatment adherence, particularly for diet and medication-related self-care.

DISCUSSION

This study found that depressive symptoms were common among patients with chronic heart failure attending internal medicine outpatient clinics, with 42.2% of participants meeting the PHQ-9 threshold for clinically significant depressive symptoms. Treatment adherence problems were also frequent, particularly for dietary adherence, followed by medication adherence and clinic follow-up. The central finding was that patients with clinically significant depressive symptoms had substantially higher odds of poor adherence across all three treatment domains. The association was strongest for dietary adherence and medication adherence, while the association with clinic follow-up was smaller but still statistically significant. These findings support the hypothesis that depressive symptoms are closely linked with weaker self-management behavior in chronic heart failure.

The observed burden of depressive symptoms is clinically important because depression in heart failure is associated with poorer functional status, reduced quality of life, increased symptom perception, and adverse clinical outcomes. Previous evidence has shown that depression is not only prevalent in heart failure populations but also prognostically relevant, with associations reported for hospitalization and mortality (13,14). The present findings are consistent with this wider evidence and highlight that depressive symptoms are highly relevant in outpatient chronic heart failure care. In this context, depressive symptoms should not be interpreted only as an emotional reaction to illness, because they may also influence daily treatment behavior, symptom monitoring, and engagement with long-term care.

Medication adherence was significantly poorer among patients with clinically significant depressive symptoms. Poor medication adherence was present in 63.2% of patients with depressive symptoms compared with 26.9% of those without depressive symptoms, corresponding to more than fourfold higher odds of poor medication adherence. This finding is consistent with previous studies showing that depression can interfere with regular medication-taking in heart failure patients (15,16). Several mechanisms may explain this relationship. Depressive symptoms can reduce motivation, impair concentration, increase forgetfulness, weaken confidence in treatment benefit, and reduce the patient's ability to maintain complex medication routines. These challenges are particularly relevant in chronic heart failure, where patients often require multiple long-term medicines and frequent dose adjustments.

The association between depressive symptoms and dietary adherence was even stronger. Nearly three-quarters of patients with clinically significant depressive symptoms had poor dietary adherence compared with approximately one-third of those without depressive symptoms. This pattern suggests that dietary self-care may be especially vulnerable to psychological distress. Dietary adherence requires daily planning, family cooperation, sustained motivation, and repeated decision-making around salt restriction, fluid awareness, and food choices. Patients experiencing low mood, hopelessness, fatigue, or reduced self-efficacy may find these behaviors more difficult to maintain over time. This finding is consistent with literature showing that psychological factors are strongly related to self-care behaviors in heart failure, including lifestyle and diet-related practices (17,18).

Clinic follow-up adherence also differed by depressive symptom status, although the magnitude of association was smaller than that observed for medication and dietary adherence. Poor follow-up was reported in 40.8% of patients with depressive symptoms and 26.9% of patients without depressive symptoms. This weaker association may reflect the fact that clinic attendance is influenced by multiple external factors, including transportation, financial constraints, physical mobility, family support, appointment availability, and distance from tertiary care services. Depressive symptoms may still

contribute to missed follow-up through fatigue, social withdrawal, hopelessness, and reduced perceived value of care, but follow-up attendance is likely shaped by both psychological and structural barriers.

A clinically meaningful severity gradient was also observed across PHQ-9 categories. Poor medication adherence, poor dietary adherence, and poor clinic follow-up all increased progressively from minimal to severe depressive symptom categories. This pattern strengthens the interpretation that depressive symptom burden is related to adherence behavior in a dose-responsive manner. Patients in the moderately severe and severe PHQ-9 categories showed the highest levels of poor adherence, particularly for dietary adherence and medication use. This gradient is important because it suggests that depression screening may help identify not only patients with emotional distress but also those at greater risk of inadequate heart failure self-management.

The findings also have practical implications for internal medicine clinics managing chronic heart failure. In routine outpatient care, poor adherence may sometimes be interpreted as lack of awareness, carelessness, or unwillingness to follow medical advice. However, the present findings suggest that depressive symptoms may be an important hidden barrier behind poor adherence. Screening for depression using a brief tool such as the PHQ-9 could help clinicians identify patients who need additional counseling, family engagement, simplified medication plans, closer follow-up, or referral for mental health support (19,20). Such an approach may be especially valuable in busy tertiary care clinics, where physical symptoms and medication prescriptions often receive more attention than psychological barriers to self-care.

The results should be interpreted within the broader context of chronic disease care in low- and middle-income settings. Patients with heart failure in Pakistan may face financial stress, limited health literacy, transport difficulties, high treatment costs, and dependence on family members for medication access, diet preparation, and clinic visits. These barriers can independently reduce adherence, and depressive symptoms may intensify their effect. Therefore, improving adherence in heart failure requires more than repeating medical advice. A patient-centered approach should consider emotional status, family support, socioeconomic constraints, and the feasibility of recommended self-care behaviors.

The study has several limitations. Its cross-sectional design allows assessment of association but does not establish causality or direction of effect. Depressive symptoms may contribute to poor adherence, but poor adherence and worsening heart failure symptoms may also aggravate depressive symptoms. The use of consecutive sampling from selected tertiary care hospitals may limit generalizability to patients treated in primary care, rural clinics, or private healthcare settings. Treatment adherence was assessed through patient report, which may be affected by recall bias or social desirability bias. In addition, adherence was categorized into good and poor domains, which improves clinical interpretability but may reduce sensitivity to more subtle behavioral differences. Potential confounding by disease severity, functional class, medication burden, socioeconomic status, and comorbidity profile should also be considered when interpreting the observed associations.

Despite these limitations, the study provides clinically useful evidence that depressive symptoms are common and strongly associated with poor adherence among patients with chronic heart failure in internal medicine outpatient settings. The separate evaluation of medication compliance, dietary adherence, and clinic follow-up adds practical value because these domains differ in behavioral demands and clinical implications. The strongest association with dietary adherence suggests that lifestyle-related self-care may require particular attention when depressive symptoms are present. Integrating mental health screening into chronic heart failure care may help identify patients at risk of poor adherence and support more comprehensive disease management.

Overall, the findings reinforce the need to view chronic heart failure management as both a biomedical and behavioral process. Pharmacological treatment remains central, but its effectiveness depends heavily on the patient's ability to sustain self-care behaviors over time. Depressive symptoms appear to

be an important barrier to this process, particularly for medication-taking and dietary restriction. Incorporating routine depression screening, brief counseling, family-based adherence support, and referral pathways for patients with significant depressive symptoms may improve the quality of heart failure care in tertiary internal medicine clinics.

CONCLUSION

Depressive symptoms were common among patients with chronic heart failure attending internal medicine outpatient clinics in tertiary care hospitals of Rawalpindi, Pakistan, and were significantly associated with poorer treatment adherence across medication, dietary, and clinic follow-up domains. The strongest adherence gaps were observed for dietary and medication-related self-care, while clinic follow-up showed a smaller but clinically relevant association. Poor adherence also increased progressively with greater depressive symptom severity, suggesting that emotional distress may identify patients at higher risk of inadequate long-term heart failure self-management. These findings support the integration of routine depressive symptom screening, patient-centered counseling, family involvement, and coordinated psychosocial support into chronic heart failure care to improve adherence and strengthen outpatient disease management.

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