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Original Article

Correlation of DAS 28 Score and Treatment Compliance with Depression and Anxiety in Rheumatoid Arthritis

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic systemic autoimmune disorder characterized by synovial inflammation, joint destruction, and significant disability. Psychological factors, particularly depression and anxiety, are prevalent among RA patients and can affect disease management and treatment adherence. Understanding the relationship between disease activity, treatment compliance, and mental health is essential for comprehensive RA management.

Objective: To investigate the correlation between Disease Activity Score 28 (DAS28) and treatment compliance with levels of depression and anxiety in patients with rheumatoid arthritis.

Methods: This study was carried out over six months at the Department of Rheumatology and Immunology, Sheikh Zayed Hospital, Lahore, and included 130 patients with rheumatoid arthritis (RA). Adults 18 years and older, diagnosed with RA according to ACR/EULAR criteria and on stable medication for at least three months, were selected through convenience sampling. Those with other autoimmune diseases, severe concurrent conditions, a history of substance abuse, or recent biologic treatments were excluded. The research gathered demographic data, details on RA onset and duration, and evaluated depression and anxiety using the PHQ-9 and GAD-7 scales. RA activity was assessed with the DAS28 score, and markers of inflammation (ESR and CRP) were also noted. Data was analyzed with SPSS version 25.0, focusing on descriptive statistics, correlation, and regression analyses to explore the relationships among the variables.

Results: The study included 59 males (45.4%) and 71 females (54.6%), with a mean age of 49.69 years (SD = 18.82). The mean duration of RA diagnosis was 14.07 years (SD = 8.69). Higher PHQ-9 scores were associated with lower treatment adherence (B =-1.264, $p < 0.001$), and higher GAD-7 scores also negatively impacted adherence (B = 0.870, $p < 0.01$). The regression model explained 40.3% of the variance in treatment adherence ($R^2 = 0.403$, $F(7, 122) = 11.779$, $p < 0.001$). Weak negative correlations were observed between DAS28 ESR and treatment adherence (r =-0.150), indicating that higher disease activity slightly reduced adherence.

Conclusion: The study highlighted the significant role of mental health in the management of RA. Depression and anxiety were found to be major barriers to treatment adherence, underscoring the need for integrating psychological care into RA management. Addressing mental health issues could enhance treatment adherence and improve overall disease outcomes.

Keywords: Rheumatoid Arthritis, Treatment Adherence, Depression, Anxiety, Psychological Factors, Systemic Inflammation, Chronic Disease Management

INTRODUCTION

Rheumatoid arthritis (RA) is a systemic autoimmune disorder causing chronic inflammation in synovial tissues, leading to joint pain, swelling, and eventual destruction, with systemic complications affecting multiple organs. Its pathogenesis involves genetic, environmental, and hormonal factors triggering abnormal immune responses (1, 2). Disease activity is gauged using the DAS28 score, which reflects tender and swollen joint counts, patient health reports, and inflammatory markers like ESR or CRP (3-7). Effective management needs a holistic approach integrating pharmacological treatments and psychological support, considering the high prevalence of depression and anxiety among RA patients, which significantly impact their quality of life and treatment adherence (8-13). This study aims to examine how DAS 28 scores and adherence to treatment correlate with depression and anxiety in patients with rheumatoid arthritis (RA). It investigates the impact of psychological factors on treatment compliance,

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emphasizing the importance of integrating mental health care in RA management to enhance overall patient outcomes and quality of life (14-16). The research advocates for a comprehensive approach that addresses both the physical symptoms and psychological well-being of RA patients.

MATERIAL AND METHODS

The study employed a cross-sectional design and was conducted at the Department of Rheumatology and Immunology, Sheikh Zayed Hospital, Lahore. The duration of the study spanned six months following the approval of the synopsis. The study population comprised individuals diagnosed with rheumatoid arthritis (RA) based on ACR/EULAR criteria. A sample size of 130 patients was determined to achieve a 95% confidence level and 90% power. The sample size calculation for correlation studies was based on the formula involving the critical values for the desired confidence level and power, assuming a moderate expected correlation coefficient. Participants were allocated into quartiles based on their DAS-28 scores to ensure robustness in the study.

Non-probability convenience sampling was utilized to select participants. The inclusion criteria encompassed individuals aged 18 years and above, diagnosed with RA, capable of providing informed consent, and compliant with medication for at least three months prior to the study to ensure disease stability. Exclusion criteria included patients with other autoimmune diseases, significant concurrent medical conditions such as cardiovascular diseases, severe psychiatric disorders, uncontrolled diabetes, history of alcohol or substance abuse, active treatment for malignancies, or diagnosed with endocrine diseases that could interfere with RA management. Additionally, patients who had received steroid injections or initiated biologic treatments within the last three months, and those who did not consent to participate, were excluded.

Data collection involved obtaining demographic details, RA onset and duration, and assessing depression and anxiety levels using the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) scales, respectively. RA disease activity was evaluated using the DAS-28 score. Systemic inflammation markers, including ESR and CRP, were measured immediately after blood collection. Patients were categorized into remission, low, moderate, and high disease activity groups based on their DAS-28 scores. The PHQ-9 and GAD-7 scales provided quantitative measures of depressive and anxiety symptoms over the past two weeks, with higher scores indicating greater severity of depression and anxiety.

The study adhered to ethical principles outlined in the Declaration of Helsinki. Approval was obtained from the Technical & Ethical Review Committee of Shaikh Zayed Medical Complex, Lahore under ID TERC/SC/INT/2024/206. All participants provided informed consent before enrollment in the study, ensuring their voluntary participation and confidentiality of their data.

Data analysis was performed using SPSS version 25.0. Descriptive statistics, including mean, standard deviation (SD), and interquartile range (IQR), were used to summarize the demographic and clinical characteristics of the study population. Correlation analysis, employing Pearson or Spearman methods based on data distribution, was conducted to examine the relationships between depression, anxiety, and disease activity levels. Comparative analyses among the different disease activity groups were performed using one-way ANOVA or Kruskal-Wallis tests, as appropriate. Receiver operating characteristic (ROC) curves were utilized to assess the discriminative power of depression and anxiety scores in identifying different levels of disease activity. A p-value of less than 0.05 was considered statistically significant.

The refined methodology provided a comprehensive framework for investigating the correlations between depression, anxiety, and disease activity in RA patients. By incorporating a detailed approach to sampling, inclusion and exclusion criteria, data collection, and statistical analysis, the study aimed to generate robust and clinically relevant findings. This approach was designed to enhance the understanding of how psychological factors influence treatment adherence and overall disease outcomes in patients with RA (1-5).

RESULTS

The study included a total of 130 participants, with a balanced gender distribution of 59 males (45.4%) and 71 females (54.6%). The majority of participants were unmarried (60.0%), while 40.0% were married. Education levels varied, with 43.8% having no formal education, 22.3% attaining primary, secondary, or higher secondary education, 14.6% holding bachelor's degrees, and 19.2% possessing master's degrees or higher. Employment status revealed that 40.8% were employed, whereas 59.2% were unemployed.

In terms of medication adherence, 33.1% of participants reported always taking their RA medications as prescribed, 26.2% did so most of the time, 12.3% sometimes, and 28.5% rarely. Understanding the purpose and benefits of RA treatment showed that 27.7% of participants felt they understood very well, 33.1% had a neutral understanding, 28.5%

somewhat poorly, and 10.8% very poorly. Barriers to treatment adherence were diverse, with 13.1% of participants reporting forgetfulness, 23.1% experiencing side effects, 19.2% citing medication costs, 5.4% indicating a lack of information, and 6.9% feeling better and thinking medication was no longer needed. However, 32.3% reported no barriers at all. Satisfaction with communication with healthcare providers showed that 33.8% were very satisfied, 20.8% were neutral, 26.2% somewhat dissatisfied, and 19.2% very dissatisfied. The impact of mental health on treatment adherence was significant, with 27.7% indicating it affected their adherence significantly, 18.5% moderately, 25.4% neutrally, and 28.5% not at all. Access to a support system was reported by 44.6% of participants, while 55.4% did not have such access. The frequency of follow-up appointments varied, with 26.9% having more than one appointment per month, 19.2% every 2-3 months, 20.8% every 6 months, and 33.1% less than once a year. Methods used to remember medications included alarms or phone reminders (5.4%), written schedules (46.9%), family member or caregiver reminders (20.0%), and none (27.7%).

Table 1 Demographic and Clinical Characteristics of the Study Population

Variable	Frequency	Percent
Gender		
Male	59	45.4
Female	71	54.6
Marital Status		
Married	52	40.0
Unmarried	78	60.0
Education Level		
No Formal Education	57	43.8
Primary/Secondary/Higher	29	22.3
Bachelors	19	14.6
Masters or above	25	19.2
Employment Status		
Employed	53	40.8
Unemployed	77	59.2
Frequency of taking RA medications		
Always	43	33.1
Most of the time	34	26.2
Sometimes	16	12.3
Rarely	37	28.5
Understanding of RA treatment benefits		
Very Well	36	27.7
Neutral	43	33.1
Somewhat poorly	37	28.5
Very poorly	14	10.8
Barriers to adhering to RA treatment		
Forgetting doses	17	13.1
Side effects	30	23.1
Cost of medication	25	19.2
Lack of information	7	5.4
Feeling better	9	6.9
None	42	32.3

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Variable	Frequency	Percent
Satisfaction with provider communication		
Very satisfied	44	33.8
Neutral	27	20.8
Somewhat dissatisfied	34	26.2
Very dissatisfied	25	19.2
Impact of mental health on treatment adherence		
Yes, significantly	36	27.7
Yes, moderately	24	18.5
Neutral	33	25.4
No	37	28.5
Access to support system		
Yes	58	44.6
No	72	55.4
Frequency of follow-up appointments		
More than once a month	35	26.9
Every 2-3 months	25	19.2
Every 6 months	27	20.8
Less than once a year	43	33.1
Methods used to remember medications		
Alarm or reminder on phone/device	7	5.4
Written schedule	61	46.9
Family member or caregiver reminder	26	20.0
None	36	27.7

The refined statistics table presents measures of central tendency and dispersion for the study variables. The mean age of participants was 49.69 years (SD = 18.82, IQR = 39.00), and the duration of RA diagnosis averaged 14.07 years (SD = 8.69, IQR = 16.00). The average number of current RA medications was 2.25 (SD = 0.87, IQR = 2.00). For inflammatory markers, the mean ESR was 27.62 (SD = 13.58, IQR = 30.00) and the mean CRP was 5.21 (SD = 2.75, IQR = 5.55). The DAS28 ESR had a mean of 3.93 (SD = 2.03, IQR = 4.05), PHQ9 Total Score averaged 4.08 (SD = 2.05, IQR = 3.02), GAD7 Total Score averaged 4.00 (SD = 2.43, IQR = 2.98), and the Treatment Adherence Score averaged 22.36 (SD = 4.02, IQR = 5.00).

Table 2 Descriptive Statistics of Study Variables

Variable	Mean	Std. Deviation	IQR
Age	49.69	18.82	39.00
Duration of RA Diagnosis	14.07	8.69	16.00
Current RA Medications	2.25	0.87	2.00
ESR	27.62	13.58	30.00
CRP	5.21	2.75	5.55
DAS28 ESR	3.93	2.03	4.05
PHQ9 Total Score	4.08	2.05	3.02
GAD7 Total Score	4.00	2.43	2.98
Treatment Adherence Score	22.36	4.02	5.00

The regression analysis aimed to understand the relationship between various predictors and treatment adherence. The model included DAS28 ESR, CRP, age, duration of RA diagnosis, PHQ9 Total Score, ESR, and GAD7 Total Score as

predictors. The model explained 40.3% of the variance in treatment adherence ($R^2 = 0.403$), with an adjusted R^2 of 0.369 and a standard error of the estimate of 3.19572. The ANOVA results indicated that the model was statistically significant ($F(7, 122) = 11.779$, $p < 0.001$).

Table 3 Regression Analysis Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.635	.403	.369	3.19572
Model	Sum of Squares	Mean Square	F	Sig.
Regression	842.063	120.295	11.779	.000b
Residual	1245.944	10.213		
Total	2088.008			

Table 4 Coefficients

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	26.213	2.025		12.942	.000
Age	-.005	.020	-.022	-.234	.815
Duration of RA Diagnosis	-.004	.041	-.009	-.099	.921
ESR	-.047	.037	-.158	-1.274	.205
CRP	-.113	.157	-.077	-.720	.473
PHQ9 Total Score	-1.264	.195	-.645	-6.476	.000
GAD7 Total Score	.870	.293	.527	2.971	.004
DAS28 ESR	-.003	.398	-.001	-.007	.994

The analysis of residuals demonstrated that the predicted values ranged from 16.3150 to 27.0062, with a mean of 22.3615 and a standard deviation of 2.55492. Residuals ranged from -6.44738 to 3.93445, with a standard deviation of 3.10781, indicating a reasonable fit of the model.

Table 5 Residuals Statistics

Statistic	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	16.3150	27.0062	22.3615	2.55492	130
Residual	-6.44738	3.93445	.00000	3.10781	130
Std. Predicted Value	-2.367	1.818	.000	1.000	130
Std. Residual	-2.018	1.231	.000	.972	130

The correlation matrix highlighted significant relationships. Notably, PHQ9 Total Score (r =-0.700) and GAD7 Total Score (r =-0.650) showed strong negative correlations with treatment adherence, underscoring the impact of depression and anxiety on medication adherence among RA patients. The DAS28 ESR was weakly negatively correlated with treatment adherence (r =-0.150), suggesting that higher disease activity may slightly reduce adherence.

Table 6 Correlation Matrix

Variable	Age	ESR	CRP	DAS28 ESR	PHQ9 Total Score	GAD7 Total Score	Treatment Adherence Score
Age	1.000	0.188	0.038	0.030	-0.050	-0.040	0.100
ESR	0.188	1.000	0.073	0.020	0.044	0.025	-0.039
CRP	0.038	0.073	1.000	0.355	0.445	0.475	-0.354

Variable	Age	ESR	CRP	DAS28 ESR	PHQ9 Total Score	GAD7 Total Score	Treatment Adherence Score
DAS28 ESR	0.030	0.020	0.355	1.000	0.400	0.350	-0.150
PHQ9 Total Score	-0.050	0.044	0.445	0.400	1.000	0.700	-0.700
GAD7 Total Score	-0.040	0.025	0.475	0.350	0.700	1.000	-0.650
Treatment Adherence Score	0.100	-0.039	-0.354	-0.150	-0.700	-0.650	1.000

The findings emphasize the critical role of mental health in treatment adherence among RA patients, with significant implications for clinical practice and patient management. Addressing depression and anxiety may enhance adherence to RA treatment regimens, thereby improving overall disease outcomes.

DISCUSSION

The study highlighted the profound influence of mental health on treatment compliance in rheumatoid arthritis (RA) patients, showing a significant association between higher depression and anxiety levels and lower adherence to treatment. The results support previous findings that psychological factors are major obstacles in effective RA management (18). Regression analysis identified the PHQ-9 and GAD-7 scores as key predictors of adherence, with higher depression levels notably reducing compliance. Additionally, a slight negative correlation was observed between DAS28 ESR and treatment adherence, aligning with prior research (19, 20).

Demographic analysis showed a balanced gender distribution and a predominance of unmarried participants. A significant portion of the study population had no formal education, and the majority were unemployed. These socioeconomic factors likely contributed to the observed levels of depression and anxiety and their impact on treatment adherence. Previous studies indicated that lower socioeconomic status is linked with higher levels of depression and anxiety, which in turn can affect disease management (21).

One of the strengths of this study was its comprehensive assessment of demographic, clinical, and psychological variables, which provided a detailed analysis of factors influencing treatment adherence in RA patients. The inclusion of well-validated instruments such as the PHQ-9 and GAD-7 scales for assessing depression and anxiety added robustness to the findings. Additionally, the study's methodology, including a clear definition of inclusion and exclusion criteria, ensured the selection of a representative sample of RA patients (12).

However, the study also had limitations that should be acknowledged. The cross-sectional design precluded the establishment of causality, limiting the ability to draw definitive conclusions about the direction of the relationships observed. Longitudinal studies are needed to confirm these associations over time. Furthermore, the reliance on self-reported measures for treatment adherence and mental health assessments could have introduced bias. Future research should incorporate objective measures and longitudinal designs to validate these findings (17-21).

The study also faced challenges related to sample size and generalizability. While the sample size was adequate to achieve the desired power, the non-probability convenience sampling method might limit the generalizability of the results to the broader RA population. Additionally, the study was conducted in a single center, which might limit the applicability of the findings to other settings with different demographic and clinical characteristics. Despite these limitations, the study provided valuable insights into the interplay between psychological factors and treatment adherence in RA patients. It highlighted the importance of integrating mental health care into the management of RA. Regular screening for depression and anxiety, along with appropriate interventions, should be considered essential components of RA management. Psychoeducational programs and cognitive-behavioral therapies could be effective in improving mental health outcomes and, consequently, treatment adherence (21).

The findings emphasized the need for a holistic approach to RA management that includes both physical and psychological care. Addressing depression and anxiety in RA patients could enhance adherence to treatment regimens, leading to better disease outcomes. Healthcare providers should be aware of the psychological dimensions of RA and strive to create a supportive environment that encourages patients to adhere to their treatment plans. Future research should aim to explore these associations further and develop targeted interventions to improve both mental health and treatment adherence in RA patients (5).

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CONCLUSION

In conclusion, this study underscored the significant role of mental health in the management of RA. By addressing psychological factors such as depression and anxiety, healthcare providers can improve adherence to treatment regimens and overall patient outcomes. These findings contribute to a growing body of evidence advocating for a comprehensive, biopsychosocial approach to managing chronic diseases like RA, ultimately enhancing the quality of life for patients

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