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# Prediction of Anxiety and Depression Based on Perceived Social Support and Socioeconomic Status in Cystic Fibrosis Patients: A Study in Tehran, Iran

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## Abstract

**Background:** Cystic Fibrosis (CF) is a chronic disease frequently associated with psychological issues like anxiety and depression, often influenced by socioeconomic status (SES) and perceived social support (PSS). This study investigated the relationship between PSS, SES, and anxiety and depression levels in CF patients.

**Methods:** A cross-sectional study involving 100 CF patients at the National Research Institute of Tuberculosis and Lung Disease (NRITLD) in Tehran, Iran (2024) utilized self-administered questionnaires for SES, Beck Anxiety Inventory (BAI), Beck Depression Inventory-II (BDI-II), and Multidimensional Perceived Social Support Scale (MPSS). Data were collected in person or online. Statistical analyses included descriptive statistics, Pearson correlations, and simultaneous multiple regression ($\alpha$=0.05).

**Results:** Simultaneous regression revealed PSS as a positive predictor of anxiety (B=0.551, $\beta$=0.309, p=0.047), and SES as a negative predictor (B=–0.532, $\beta$=–0.570, p=0.001), explaining 23.2% of anxiety variance (R=0.482, $R^2$=0.232; F(2,97)=7.11, p=0.002). The depression model was also significant (R=0.594, $R^2$=0.301; F(2,97)=10.13, p<0.001), with SES being a significant negative predictor (B=–0.705, $\beta$=–0.496, p=0.001), while PSS had a non-significant negative effect (B=–0.242, $\beta$=–0.089, p=0.540). Durbin–Watson statistics were 1.457 for anxiety and 0.985 for depression. Both anxiety and depression scores negatively correlated with PSS (r=–0.496, p≤0.05).

**Conclusion:** PSS and SES are significantly associated with anxiety and depression in CF patients. Enhancing social support and addressing socioeconomic disparities could improve psychological well-being. Early screening and targeted interventions are recommended for managing mental health in this population.

**Keywords:** Anxiety, Cystic fibrosis, Cross-sectional studies, Depression, Mental health, Socioeconomic factors, Social support

## Introduction

Cystic Fibrosis (CF) is a chronic and debilitating genetic disorder that primarily affects the respiratory and digestive systems. Due to the complex and ongoing therapeutic management it requires, CF not only imposes physical challenges but also has significant psychological and social implications for patients and their families (1-6). The continuous challenges associated with managing the disease -such as the need for expensive medications, respiratory care, and dietary restrictions-can lead to a wide range of psychological effects. These mental health issues are particularly prominent in patients who, due to physical limitations, are unable to engage in daily and social activities. Anxiety and depression are among the most common psychological problems identified in this group of patients and are often associated with factors such as Socioeconomic Status (SES) and Perceived Social Support (PSS) (11-15). Various studies have indicated that changes in how patients perceive their illness and social environment can significantly influence the levels of anxiety and depression they experience (16-18).

Socioeconomic conditions are one of the key factors affecting the mental health of CF patients. The high treatment costs, including medications, medical equipment, and frequent visits to healthcare centers, often exceed the financial capacity of many families, creating additional financial pressures on patients and their families (19-21). Moreover, these high costs usually lead to financial debts or reduce families' ability to meet other basic needs, such as proper nutrition or education. This situation can have devastating effects on the morale of patients and their families. Financial limitations, in addition to affecting access to quality care, can lead to feelings of helplessness and hopelessness in patients. These problems are particularly impactful in countries with weaker support systems and greater economic burdens on families. Research, particularly in developing countries, has shown that financial concerns and high treatment costs may even lead to a decreased quality of life for CF patients (22-24). For example, in Iran, challenging economic conditions, especially in recent years, can significantly increase anxiety and depression levels in CF patients (20).

Alongside SES, PSS plays a significant role as a protective factor against psychological problems. Patients who feel supported by family, friends, or the community generally experience lower levels of anxiety and depression (16). Social support can be provided emotionally, financially, or even practically, and it plays a crucial role in alleviating the stress caused by the disease. Research has shown that having consistent support networks can help reduce psychological problems (24,25).

However, families with low SES may have limited support networks, reducing their ability to provide adequate support to patients. This lack of social support, especially in societies where there is social stigma surrounding chronic illnesses, can exacerbate psychological issues. For instance, in some cultures such as Iran, CF patients may feel excluded by others due to their physical and social limitations, which in turn contributes to feelings of loneliness and depression (20).

Another important aspect related to the mental health of CF patients is the interaction between social support and SES. Numerous studies have demonstrated that the negative impact of economic conditions on mental health becomes more pronounced in the absence of social support from family or friends (16). This is particularly true for CF patients who continuously struggle with respiratory and digestive problems, leading to higher levels of anxiety and depression. Therefore, research highlights the importance of both social support and access to financial and medical resources to mitigate the psychological challenges faced by CF patients (26,27).

The combination of poor SES and insufficient social support can significantly increase levels of anxiety and depression in CF patients. These psychological problems not only reduce patients' quality of life but also negatively impact their adherence to treatment plans. Adherence to CF treatments typically requires considerable time and effort, and if patients lose motivation due to psychological issues, the likelihood of successful treatment decreases. For instance, patients suffering from anxiety or depression may neglect attending therapy sessions or taking medications regularly, leading to poorer clinical outcomes (23). Some studies have observed that anxiety and depression can directly affect treatment adherence and undermine therapeutic outcomes (28).

In this regard, various studies indicated that patients' perceptions of their disease and the available social support can significantly affect their levels of anxiety and depression. For instance, some research has revealed that changes in how patients perceive CF can directly impact the reduction of anxiety and depression (16). Additionally, these studies highlight that utilizing consistent support networks, particularly support from family and friends, can help alleviate psychological problems in these patients. These findings suggest that addressing these factors can contribute to improving the quality of life of CF patients and enhancing their adherence to treatments. Therefore, further research on the impact of the interaction between SES and social support on the psychological well-being of CF patients is essential to provide better strategies for reducing their psychological problems and improving their quality of life (19,20). Therefore, this study aimed to predict anxiety and depression based on perceived social support and SES in CF patients.

It was hypothesized that among cystic fibrosis patients, greater perceived social support and higher socioeconomic status will each be associated with lower levels of both anxiety and depression, such that the combined predictive model including PSS and SES will explain a significant portion of variance in psychological distress.

## Materials and Methods

### Study design

This study was fundamental in its objectives, and in terms of nature and methodology, was a descriptive-correlational study.

### Population and sampling

The statistical population of this study consisted of cystic fibrosis patients visiting the CF clinic at National Research Institute of Tuberculosis and Lung Disease (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, in 2024. In this study, the patients were selected using a convenience sampling method, and the total number of participants was 100.

### Inclusion and exclusion criteria

Inclusion criteria were: (a) confirmed diagnosis of cystic fibrosis, (b) age 18–60 *yr*, and (c) ability to understand and complete self-report questionnaires. Exclusion criteria were: (a) current acute pulmonary exacerbation requiring hospitalization, (b) comorbid severe psychiatric disorder (*e.g.*, schizophrenia, bipolar disorder), and (c) incomplete questionnaire data (>10% missing).

### Measures and instruments

For data collection, three standard questionnaires (valid and reliable) were used: Beck Anxiety Inventory (BAI; 21 items, Cronbach's α=0.90; Beck *et al*) (29); Beck Depression Inventory-II (BDI-II; 21 items, Cronbach's α=0.88; Beck *et al*) (30); Multidimensional Perceived Social Support Scale (MPSS; 12 items, Cronbach's α=0.92 in our sample; Zimet *et al*, 1988) (31); and the Socioeconomic Status Questionnaire (10 items covering income, education, and occupation; Cronbach's α=0.85; Garmaroudi *et al*) (32).

To assess SES, the questionnaire developed by Garmaroudi *et al* was used. This 25-item instrument covers patient and spouse education, household size relative to housing area, cost per square meter of residential property, availability of household facilities, and family income. Responses are scored with weighted points (*e.g.*, 2 points for primary education and 17 points for a doctoral degree). The maximum possible score is 48, and a cut-off of 16 is applied to classify families into "low" *vs*. "adequate" SES groups. The instrument demonstrated strong internal consistency (Cronbach's α=0.87), and its validity and reliability were repeatedly confirmed in Iranian populations.

Anxiety and depression were measured using the Beck Anxiety Inventory (BAI) and the BDI-II. Each scale consists of 21 items rated on a 4-point Likert scale (0–3), yielding a total score between 0 and 63, with higher scores reflecting greater severity. A cut-off score of 9 was reported in Iranian populations for distinguishing clinical from non-clinical cases. Both instruments have shown good psychometric properties in Persian versions, with internal consistency coefficients of α=0.87 and test–retest reliability of 0.74, as well as confirmed construct validity in multiple Iranian studies.

Perceived social support was assessed using the "Multidimensional Scale of Perceived Social Support

(MSPSS)" developed by Zimet *et al*. This 12-item questionnaire measures support from family, friends, and significant others, scored on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). Total scores range from 12 to 60, with higher scores reflecting greater perceived support. A score of 31 or above indicates adequate social support. The Persian version of the MSPSS has shown excellent psychometric properties, including high internal consistency (Cronbach's α=0.82), and its validity and reliability have been confirmed in several Iranian studies. Each of these questionnaires was completed separately, with a ten-*min* rest interval between each one.

### Study procedure

Initially, in a session attended by the participants or their parents, the purpose and importance of the research were explained, and written consent to participate was obtained. Then, the patients completed the questionnaires. In cases where physical access to patients was difficult, the questionnaires were prepared online, and the links were shared through patients' treatment and counseling groups on social media.

### Data analysis

The data were collected and entered into SPSS 26 (IBM Corp., Armonk, NY, USA) for analysis. Descriptive statistics were used to calculate the mean, standard deviation, and proportions. After checking assumptions (normality, homoscedasticity), Pearson correlations were run to assess bivariate associations. Simultaneous multiple linear regressions predicted anxiety and depression from PSS and SES. Then, to adjust for confounding, a generalized linear model (identity link) was applied for each outcome, entering age, sex (0=male, 1=female), and length of hospitalization as covariates. A significance threshold of α=0.05 was used.

### Ethical considerations

All the steps performed in this study were based on the terms of the Helsinki Convention. In addition, written informed consent was obtained from the patient, her/his parents, or the legal guardian. Participation in this research was voluntary, and all the participants had the right to withdraw from the study at any time. Throughout the research process, all efforts were made to maintain the privacy and anonymity of participants' personal information, and the questionnaires were designed anonymously to preserve participants' identities. Before distributing the questionnaires, the purpose and significance of the study were fully explained to the participants. Additionally, all individuals with moderate to severe levels of depression were referred to the appropriate specialists for further evaluation and counseling. Carrying out the project required obtaining a code of ethics from the ethics committee of the National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran (IR.SBMU.NRITLD.REC.1403.097).

## Results

All variables were examined for compliance with linear regression assumptions. Shapiro–Wilk tests indicated normal distribution for anxiety (W=0.98, p=0.17) and depression (W=0.97, p=0.12). Scatterplots of residuals against predicted values showed no deviation from linearity or homoscedasticity. Durbin–Watson statistics (1.457 for anxiety; 0.985 for depression) confirmed independence of residuals. Variance inflation factors for PSS and SES were all below 2, indicating no multicollinearity concerns.

In total, 42% of the patients were women, and 58% were men. The mean age of the patients was 21.86 *yr* with a standard deviation of 8.67 *yr*. The minimum age was 4 *yr*, and the maximum age was 44 *yr*. The mean length of hospitalization for the patients was 17.84 days with a standard deviation of 8.64 days. The minimum hospitalization duration was 3 days, and the maximum was 40 days.

### Anxiety, depression, SES and PSS in CF patients

Based on the recommended cut-off score of 9 on the Beck inventories, 38% of the patients scored above the threshold for clinically significant anxiety, and 42% scored above the threshold for depression. This indicates that a substantial proportion of the sample experienced moderate-to-severe psychological distress.

**Table 1.** Distribution of anxiety, depression, SES and PSS in CF patients

| Variable | Min. | Max. | Median | Mode | Mean ± SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| Anxiety | 0 | 43 | 2 | 0 | 4.50±7.81 | 3.52 | 14.14 |
| Depression | 0 | 48 | 4.50 | 0 | 8.58±11.89 | 1.57 | 1.788 |
| SES | 44 | 63 | 53 | 56 | 53.30±4.01 | -1.06 | 0.501 |
| PSS | 20 | 60 | 50 | 60 | 48.11±94.43 | -0.251 | -0.081 |

Socioeconomic Status (SES); Perceived Social Support (PSS).

**Table 2.** Regression model predicting anxiety levels in patients based on PSS and SES

| Model | Unstandardized coefficients | | Standardized coefficients | T | p-value |
|---|---|---|---|---|---|
| | B | Standard error | Beta | | |
| Constant* | 23.488 | 6.536 | - | 3.594 | 0.001 |
| PSS | 0.551 | 0.270 | 0.309 | 2.044 | 0.047 |
| SES | -0.532 | 0.141 | -0.570 | -3.771 | 0.001 |

* 'Constant' represents the regression intercept, indicating the predicted value of anxiety when all predictor variables (PSS and SES) are equal to zero.
Socioeconomic Status (SES); Perceived Social Support (PSS).

Table 1 presents the frequency distribution of PSS, SES, anxiety, and depression variables among patients with cystic fibrosis. The social support variable had the highest mean score of 94.43 with a standard deviation of 48.11 among the patients. The socio-economic status had a mean score of 4.01, indicating a relatively moderate economic status of the patients. Anxiety and depression both showed high variability and asymmetrical distribution, indicating that some patients had more severe conditions in these areas.

### *Predicting anxiety in CF patients based on PSS and SES*

The simultaneous regression model, with PSS and SES entered as predictors, accounted for a moderate yet significant portion of variance in anxiety among cystic fibrosis patients. The overall correlation coefficient was R=0.482, indicating a moderate positive association between the combined predictors and patient anxiety. The $R^2$ value of 0.232 shows that 23.2% of the variability in anxiety scores is explained by PSS and SES. In particular, higher perceived stress was associated with increased anxiety levels (positive effect), while SES also contributed meaningfully to the prediction with a negative effect, underscoring the role of socio-economic factors. The Durbin–Watson statistic of 1.457 falls within acceptable bounds, confirming that residuals are independent. These findings support the predictive validity of the model.

### *Impact of PSS and SES on anxiety in cystic fibrosis patients*

The regression prediction equation for analyzing the impact of PSS and SES on anxiety in cystic fibrosis patients is presented in table 2. The equation is as follows: $Y' = 23.488 + 0.551\ (PSS) - 0.532\ (SES)$.

In this equation, Y' represents the predicted level of patients' anxiety, calculated based on the two independent variables (PSS and SES). According to the standardized coefficients, it is observed that each unit increase in PSS has a significant positive effect on patients' anxiety (coefficient+0.551), indicating that higher PSS is associated with increased anxiety levels. On the other hand, SES has a negative and relatively smaller impact on predicting anxiety (coefficient -0.532). This suggests that higher SES is associated with lower anxiety, although its effect is less pronounced than that of PSS. The results also indicate that both PSS and SES are significantly ($p \leq 0.05$) associated with patients' anxiety levels. This means that changes in these two variables can significantly predict the anxiety levels of cystic

**Table 3.** Regression model for predicting depression levels in patients based on PSS and SES

| Model | Unstandardized coefficients | | Standardized coefficients | T | p-value |
|---|---|---|---|---|---|
| | B | Standard error | Beta | | |
| Constant* | 50.817 | 9.498 | - | 5.351 | 0.001 |
| PSS | -0.242 | 0.392 | -0.089 | -0.618 | 0.540 |
| SES | -0.705 | 0.205 | -0.496 | -3.437 | 0.001 |

* 'Constant' represents the regression intercept, indicating the predicted value of depression when all predictor variables (PSS and SES) are equal to zero. Socioeconomic Status (SES), Perceived Social Support (PSS).

fibrosis patients.

### *Predicting depression levels in cystic fibrosis patients based on PSS and SES*

A simultaneous regression analysis with PSS and SES as predictors yielded a significant model predicting depression levels in cystic fibrosis patients: R=0.594, $R^2$=0.301, Adjusted $R^2$=0.272, Standard Error=10.16. The Durbin–Watson statistic was 0.985, indicating that residuals are independent. These findings demonstrate that approximately 30.1% of the variance in depression scores is explained by PSS and SES.

### *Effect of PSS and SES on depression in cystic fibrosis patients*

A multiple regression analysis assessed the impact of PSS and SES on depression in cystic fibrosis patients. The overall model was significant, F (2, 47)=10.13, p<0.001, with a regression sum of squares of $SS_{(reg)}$=2090.10 (df=2; MS=1045.05) and a residual sum of squares of $SS_{(res)}$=4848.08 (df=47; MS=103.15), indicating that variations in PSS and SES reliably explain differences in depression scores.

### *Predicting depression levels in patients based on PSS and SES*

The regression prediction equation for examining the impact of PSS and SES on depression in cystic fibrosis patients is provided. The prediction equation is as follows: Y′=50.817-0.242 (PSS)− 0.705 (SES) (Table 3).

In this equation, Y' represents the predicted level of depression in patients, calculated based on two independent variables (PSS and SES). According to the standardized coefficients, it can be observed that each unit change in perceived social support has a significant negative effect on the depression of patients (coefficient -0.242). This means that an increase in perceived PSS can lead to a reduction in the depression levels of the patients. On the other hand, SES also has a significant negative effect on predicting depression (coefficient -0.705). This indicates that a higher SES may be associated with lower depression, although its impact is greater than that of PSS. The results from table 3 also indicate that both variables, PSS and SES, are significantly related to the depression levels of the patients (p≤0.05). This means that changes in these two variables can significantly predict the depression levels in cystic fibrosis patients.

## Discussion

The findings of this research indicated that, given the significance of PSS and SES (p≤0.05), the level of anxiety in cystic fibrosis patients is significantly associated with these factors. Consistent with this finding, Taylor-Robinson (33) demonstrated that poorer SES is linked to worse psychological effects like anxiety in cystic fibrosis. Similarly, Oates (22) reported that household income is associated with anxiety levels. The results of Havermans *et al* (13) revealed that PSS (b=0.35, p<0.001) was strongly associated with anxiety ($R^2$=0.66), and PSS proved to be a better correlate of anxiety. The findings of Olveira *et al* (27) suggested that, regardless of lung function, patients with anxiety reported poorer health-related quality of life. Flewelling *et al* (16) also showed that greater social support correlated with reduced mental health symptoms over time. Social support was further linked to improved emotional, social functioning, and vitality. The study by Dębska *et al* (34) indicated that higher social support was

linked to lower psychological burden (anxiety) and the perceived need for care. Moreover, Coelho *et al* (35) demonstrated that lower SES is generally related to psychological complications such as anxiety. Gulledge *et al* (17) found that improvements in mental health (*e.g.*, reduced anxiety) correlate with increased social support in CF patients.

Although the findings of the above-mentioned studies align with the results of the present research-confirming the association between anxiety levels, PSS, and SES, a few studies have reported contradictory results. Quon *et al* (36) found that no socio-demographic factors show significant associations with anxiety scores for generalized anxiety disorder in adult CF patients. Similarly, Mursaloğlu *et al* (37) reported that none of the demographic characteristics showed significant associations with depression or anxiety in adult cystic fibrosis patients. The discrepancy between the findings of these studies and the present research can likely be attributed to differences in the study population (particularly age distribution), sample size, and the data collection tools used.

Overall, the current study findings underscore the critical role of both PSS and SES in shaping anxiety levels among cystic fibrosis patients. Future longitudinal research is needed to clarify the directional nature of these relationships and to inform targeted interventions.

### *Limitations*

Limitations include the cross-sectional design, single-site convenience sampling, and reliance on self-report measures. Future work should use larger, multi-center, and longitudinal designs.

## Conclusion

The findings of this study demonstrated that PSS and SES significantly predict psychological outcomes in cystic fibrosis patients. Higher PSS was associated with increased anxiety, whereas higher SES was linked to lower anxiety levels. For depression, SES had a stronger negative effect, while PSS did not show a significant association. Overall, PSS played a more prominent role in predicting anxiety, whereas SES was more influential in predicting depression. These results emphasize the importance of strengthening social support networks and addressing socioeconomic disparities in order to improve mental health and quality of life among patients with cystic fibrosis.

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## Conflict of Interest

Authors declare no conflict of interest.

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