# Socio-Demographic Determinants of Medication Compliance in Bipolar Disorder Patients in Lahore, Pakistan

Mubeen Fatima[1], Ahmad Umar[1], Abdul Sammad Ali Khan Shirwany[1], Abdul Majeed Akhtar[1], Awais Gohar*[1], Syed Hanzila Azhar[2]

*[1]Department of Public Health, University of Lahore, Pakistan*
*[2]Department of Health Sciences, University of Debrecen, Debrecen, Hungary*
*\*Corresponding author`s email address:* dr.awais.gohar@gmail.com

**Abstract:** *Medication non-compliance is a major challenge in the long-term management of bipolar disorder, contributing to relapse, hospitalization, and poor quality of life. Socio-demographic factors can significantly influence adherence behavior, yet data specific to the Pakistani population remain limited.* **Objectives:** *The study's primary objective was to evaluate medication compliance in bipolar patients and identify the associated socio-demographic variables affecting medication compliance.* **Methodology:** *An analytical cross-sectional study was conducted at the teaching hospital in Lahore, Punjab, which specializes in mental health. A questionnaire based on the Self-Efficacy for Appropriate Medication Use Scale (SEAMS) was utilized, with a sample size of 296 patients aged 18 and above. Statistical analysis was performed using R Studio software.* **Results:** *The analysis revealed a median SEAMS score of 19 (IQR = 18, 22). Males demonstrated slightly higher adherence than females (median SEAMS score of 20 vs. 19, respectively). Unmarried individuals exhibited better adherence (median = 21) than married participants (median = 19). Students reported the highest compliance (median = 22), while unemployed individuals had the lowest (median = 18). Significant differences in SEAMS scores were observed across employment and education levels. The robust gamma regression analysis confirmed that uneducated participants (exp(β) = 0.836, p < 0.001) and unemployed individuals (exp(β) = 0.980, p = 0.219) exhibited lower adherence. Additionally, those aged 30-44 and 45-59 showed significantly higher adherence (exp(β) = 1.048, p = 0.014 and exp(β) = 1.050, p = 0.026, respectively).* **Conclusion:** *The study highlights the significant influence of sociodemographic factors, particularly employment status and education level, on medication compliance. While gender and age also contribute, the findings suggest that targeted interventions aimed at addressing disparities in employment and education could improve medication adherence in patients with bipolar disorder.*

**Keywords:** Medication compliance, Bipolar disorder, SEAMS, and Medication adherence

## Introduction

Medication compliance refers to the extent to which a patient's behavior conform to the recommended drug regimen (1). The World Health Organization reports that 40 million people worldwide suffer from bipolar disorder (BD), a mental health illness for which medication compliance is essential to effective treatment (2). Although significant advancements have been made in the field of pharmacotherapy there are still about 50% of patients that do not take their drugs as directed that results in making non-adherence a serious problem (3). Studies regularly show significant rates of noncompliance, with one study estimating total non-adherence in 41.8% of psychiatric patients and BD being ranked as a mental disorder with second lowest compliance (4). Relapses and readmission to hospitals are significantly associated with Noncompliance (5), that result in serious consequences for both patients and healthcare systems. One study concluded that the non-compliance rate among BD patients was 23.6% all through a 21-month follow-up period and have drawn association of low compliance with patients more likely to be hospitalized and attempt suicide (6).

There are several complex factors that influence the medication compliance among the patients suffering from various mental disorders. The most important of these determinants are the efficacy and accessibility of the treatment, social and cultural variables such as family support, cultural beliefs, and societal stigma (7)(8). Medication adherence is further complicated by cognitive impairment, a more particular risk associated with mental disorders (9). Memory and executive function impairments are especially significant because they make it challenging for patients to adhere to 'difficult to understand' treatment plans, which further leads to poor adherence (9). In addition, sociodemographic variables including age, gender, and occupation may have an impact on medication adherence (10) (11). As these sociodemographic characteristics are unique and may vary region to region, there is a need for their comprehensive understanding of how they influence medication adherence, specially, in patients living in developing countries like Pakistan.

Although there is little research on bipolar disorder in Pakistan, statistics place the prevalence of serious mental illnesses (BP and Schizophrenia) at 1% to 2% of the population (12). There are various socio-economic factors that contribute to the problem of non-compliance i.e. Stigma and financial limitations (13). Moreover, mental health access in Pakistan is limited by a shortage of psychiatrists, with most concentrated in urban areas. The country has only four psychiatric hospitals and merely 2.1 psychiatric beds per 100,000 people, creating significant barriers, especially in rural regions (14). Understanding how bipolar patients in Pakistan adhere to their medication is critical, given the prevalence of the disorder and the significant impact of social, economic, and health system challenges on treatment compliance. Our study aims to identify key socio-demographic factors—such as education, employment status, gender, and age—play a pivotal role in shaping medication adherence. By understanding these trends, targeted interventions and policies can be developed to improve mental health care in Pakistan, with potential applications in similar socio-cultural settings

## Methodology

The study received ethical approval from the University of Lahore Ethical Review Committee (Approval Number: REC/UOL/460/08/24). This cross-sectional study was conducted in Lahore, Pakistan, between

January 2024 and June 2024. The research was conducted at one public tertiary care hospital in Lahore, Pakistan, specializing in mental care. The study participants comprised BP patients registered in the hospitals' Outpatient Departments (OPDs). Recruitment of participants involved daily screening in the OPDs of a tertiary care hospital in Lahore, Pakistan. All patients diagnosed with BP disorder by the medical doctors were eligible to participate in the study. Eligible participants were requested to select their preferred language, day, and time for interview participation. The sample size for this study was calculated using Daniel's equation (15). The calculation was based on the prevalence data of 26% of BP patients reported by one of the studies conducted in Pakistan (16). The resulting sample size for this study was 296 participants. The hospital's OPD recruited participants using the non-probability convenience sampling technique. Participants were found to be eligible for recruitment in the study if they had been clinically diagnosed with bipolar disorder, were aged 18 years or older, and were willing to participate. All those BP patients who were having comorbid substance use disorders (e.g., alcohol or drug abuse) or severe cognitive impairments that might have interfered with informed consent or self-reporting were excluded from the study. The data collection phase encompassed the period from March 2024 to April 2024. Face-to-face interviews were conducted with eligible participants. A validated questionnaire comprising socio-demographic variables and the Self-efficacy for Appropriate Medication Adherence Scale (SEAMS) was administered (17). SEAMS is a validated tool specifically developed to measure patients' confidence in adhering to medication regimens, particularly in the management of chronic diseases like bipolar disorder. For data analysis, the R programming language was utilized. The distribution of the outcome variable (SEAMS score) was determined using the Shapiro-Wilk test. The distribution was found to be positively skewed. Medians and interquartile ranges (Q1, Q3) were used to summarize sociodemographic characteristics and SEAMS scores. Finally, a robust gamma regression model was used to evaluate the effect of sociodemographic factors on medication adherence, with employment status, education level, and age group as predictors. To enhance the interpretability of the model, non-significant predictors (p-value > 0.05), including gender and marital status, were removed from the initial model employing backward elimination. Results were reported as exponentiated regression coefficients (exp(β)) with 95% confidence intervals (CI), with $p < 0.05$ considered significant.

## Results

The median compliance rate among the study population (n=296) was 19 out of a total score of 39, with the highest values indicating greater medication compliance. Moreover, the adherence rate showed variations based on several sociodemographic characteristics of the study population.

Table 1 provides a detailed overview of medication compliance in patients with bipolar disorder, categorized by various sociodemographic characteristics. For gender, females comprise 49.3% of the sample with a median Self-Efficacy for Appropriate Medication Use Scale (SEAMS) score of 19, while males constitute 50.7% with a median SEAMS score of 20. Regarding marital status, 28.0% of the participants are unmarried, showing a median SEAMS score of 21, whereas 72.0% are married with a median SEAMS score of 19. Employment status reveals that 31.4% are employed or working, with a median SEAMS score of 20, 16.6% are students with a median SEAMS score of 22, and 52.0% are unemployed with a median SEAMS score of 18. Regarding education level, 5.74% hold a bachelor's degree (B.A) with a median SEAMS score of 22, 2.70% have an intermediate (F.A.) certificate with a median SEAMS score of 21, 25.0% have completed matriculation with a median SEAMS score of 22, and 66.6% are uneducated with a median SEAMS score of 18. Lastly, the age group distribution shows that 38.5% are aged 18-29 with a median SEAMS score of 20, 34.5% are aged 30-44 with a median SEAMS score of 19, 17.2% are aged 45-59 with a median SEAMS score of 19, and 9.80% are aged 60+ with a median SEAMS score of 19. This data highlights the variations in medication compliance among different sociodemographic groups in patients with bipolar disorder.

The robust gamma regression analysis on medication compliance in patients with bipolar disorders showed that the intercept has a strong positive effect with an exponentiated regression coefficient (exp(β)) of 1.980, indicating a significant baseline level of compliance as shown in Table 2. For employment status, unemployed individuals had a lower exp(β) of 0.980 (95% CI: 0.948, 1.012, p = 0.219) compared to employed individuals, while students had an exp(β) of 1.041 (95% CI: 0.986, 1.099, p = 0.148). Similarly, Education level revealed that uneducated participants had a significantly lower exp(β) of 0.836 (95% CI: 0.787, 0.889, p < 0.001). F.A. certificate holders had an exp(β) of 0.918 (95% CI: 0.831, 1.014, p = 0.091), while matriculation graduates had an exp(β) of 0.958 (95% CI: 0.900, 1.020, p = 0.181). Moreover, for Age, participants aged 30-44 had an exp(β) of 1.048 (95% CI: 1.009, 1.088, p = 0.014), while those aged 45-59 had an exp(β) of 1.050 (95% CI: 1.006, 1.097, p = 0.026). Individuals aged 60+ showed an exp(β) of 1.024 (95% CI: 0.967, 1.084, p = 0.371)

The final robust gamma regression model included employment status, education level, and age group as predictors. The results are summarized in Table 2

**Table 1: Sociodemographic Characteristics and descriptive analysis of SEAMS scores**

| Variable | Categories | N (%) | Median SEAMS Score (Q1, Q3) |
|---|---|---|---|
| Gender | Female | 146 (49.3%) | 19 (17, 21) |
| | Male | 150 (50.7%) | 20 (18, 22) |
| Marital Status | Not Married | 83 (28.0%) | 21 (19, 23) |
| | Married | 213 (72.0%) | 19 (17, 22) |
| Employment Status | Employed/Working | 93 (31.4%) | 20 (18, 22) |
| | Student | 49 (16.6%) | 22 (21, 23) |
| | Unemployed | 154 (52.0%) | 18 (16, 20) |
| Education Level | B.A. | 17 (5.74%) | 22 (21, 23) |
| | F.A. | 8 (2.70%) | 21 (18, 23.25) |
| | Matric | 74 (25.0%) | 22 (20, 23) |
| | Uneducated | 197 (66.6%) | 18 (16, 21) |
| Age Group | 18–29 | 114 (38.5%) | 20 (18, 22) |
| | 30–44 | 102 (34.5%) | 19 (17, 21) |
| | 45–59 | 51 (17.2%) | 19 (17, 20) |
| | 60+ | 29 (9.80%) | 19 (18, 20) |

**Table 2: Robust Gamma Regression Results**

| Predictor | exp(β) | 95% CI Lower | 95% CI Upper | p-value |
|---|---|---|---|---|
| (Intercept) | 21.84 | 20.43 | 23.35 | <0.001 |
| Employment (Student) | 1.041 | 0.986 | 1.099 | 0.148 |
| Employment (Unemployed) | 0.980 | 0.948 | 1.012 | 0.219 |
| Education (F.A.) | 0.918 | 0.831 | 1.014 | 0.091 |
| Education (Matric) | 0.958 | 0.900 | 1.020 | 0.181 |
| Education (Uneducated) | 0.836 | 0.787 | 0.889 | <0.001 |
| Age Group (30–44) | 1.048 | 1.009 | 1.088 | 0.014 |
| Age Group (45–59) | 1.050 | 1.006 | 1.097 | 0.026 |
| Age Group (60+) | 1.024 | 0.967 | 1.084 | 0.371 |

## Discussion

Medication compliance is a significant issue among the people suffering from mental disorders with half of the patients diagnosed with bipolar disorder (BD) become non-adherent during long-term treatment (18). Effective maintenance medications are essential for long-term treatment of bipolar disorder, but nonadherence is common and linked to increased relapse, hospitalization, and suicide risk (19). The sociodemographic characteristics of bipolar patients may have significant impact on the compliance rate of the treatment. This study analyzed 296 participants to assess the association between the sociodemographic factors that are specific for the lower middle-income countries like Pakistan, and medication adherence among the bipolar patient's medication.

The median compliance rate among the bipolar patients was 19 which is significantly lower based on the SEAMS scores interpretations (20). The finding of this study indicating low medication adherence are similar to the studies conducted in LMICs settings where the medication non-adherence was more than half of the BP patients (11) (21). While one study conducted in Spain a developed and high-income country, estimated the medication adherence of 83% indicating good treatment compliance (22). Moreover, significant variations in adherence were observed across different sociodemographic groups. Specifically, education level and age emerged as significant predictors of medication compliance

According to the results, age also played a pivotal role in medication compliance among bipolar patients. The positive association observed in the 30-44 and 45-59 age groups while younger (18-29) and older (60+) populations may encounter unique barriers resulting in comparatively lower adherence. There are several studies that suggest that younger age might be the risk factor for the non-adherence (10,23). Alternatively, greater age is a weak indication for medication (24). These conflicting results emphasize the complexity of medication adherence and suggest that age-associated difficulties could be linked to other psychosocial and sociodemographic factors.

In general, the strong link between lower educational levels and lower medication adherence highlights the need for personalized educational programs that ease drug regimens and increase patients' knowledge of their therapy. Age related disparities in medication compliance further emphasize on age specific approaches. One suitable intervention for young people could be the introduction of mobile health applications that may give them a reminder to take medicine and fit their busy lifestyles. On the other hand, older adults may benefit from having their medication regimes simplified to address polypharmacy and cognitive decline. By putting these focused strategies into practice, people with bipolar disorder may improve their quality of life and clinical results by increasing medication adherence. However, the research's reliance on data from a single healthcare facility may limit the findings' generalizability. To acquire more thorough and representative insights into medication compliance among bipolar patients, future research should investigate undertaking national surveys that include varied healthcare settings and broader populations.

## Conclusion

The findings from this study provide evidence that patients with bipolar illness have a low median medication compliance rate, which is strongly impacted by sociodemographic variables including age and educational attainment. Those in younger and older age groups, as well as people with less education, showed less adherence to their prescription regimens. These findings emphasize the need for age-appropriate tactics and focused instructional programs to increase drug adherence.

## Declarations

**Data Availability statement**
All data generated or analysed during the study are included in the manuscript.
**Ethics approval and consent to participate**
Approved by the department concerned. (REC/UOL/460/08/24)
**Consent for publication**
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## Conflict of interest

The authors declared the absence of a conflict of interest.

## Author Contribution

**MF**
*Manuscript drafting, Data entry, Study Design, Review of Literature*
**AU**
*Conception of Study, Study design, Data analysis, and article drafting.*
**ASAKS**
*Study Design and Research Methodology Development*
**AMA**
*Study Design, manuscript review, and critical input.*
**AG**
*Manuscript drafting and Study Design,*
**SHA**
*Review of Literature and drafting an article.*

*All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.*

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