Nonadherence in bipolar disorder patients: A 14-year retrospective study

Dinesh Narayanan, Arya Jith, Rahul Bansal
Department of Psychiatry, Amrita Institute of Medical Sciences, Kochi, Kerala, India

ABSTRACT

Background: Bipolar disorder is a disabling psychiatric disorder. The existing literature suggests about 41% of patients to be nonadherent. Nonadherence leads to relapses, delay in recovery besides higher inpatient care cost as well as higher global cost of the disease. Nonadherence in bipolar affective disorder (BPAD) is a complex phenomenon, its critical determinants are yet to be identified with certainty.

Aims: This study aims to assess the prevalence of nonadherence in BPAD and to delineate the factors associated with it.

Methods: Medical records were reviewed in this study from 2005 to 2019 at a medical college in Kerala. Patients who were diagnosed with BPAD according to International Classification of Diseases 10 and who were needing or opting for prophylaxis were included. Patients who were not taking medications for at least 1 week were termed as nonadherent. We included 150 participants in our study.

Results: To test the statistical significance of the association of categorical variables between H/O of adherence and nonadherence, Chi-square test was used. In the sample, 82.7% had at least 1 week of history of noncompliance in the past. The most common reason was poor understanding of illness by the family (56%) followed by a negative aspect of the patient toward the drug (20%).

Conclusion: Therefore, this study concludes that though majority of the patients have a history of nonadherence of at least 1 week on long-term follow-up, it was seen that majority of the patients were more than 80% adherent to medications.

Key words: Bipolar disorders, nonadherence, prevalence

INTRODUCTION

Bipolar affective disorder (BPAD) is a chronic, disabling psychiatric disorder which can cause significant morbidity and mortality.[1] It is an episodic illness with fluctuating level of severity of manic and depressive symptoms with euthymic period.[2] The current prevalence of BPAD is 0.4%–0.5%.[3] One year prevalence rate is 0.5%–0.4% and lifetime prevalence is 2.6%–7.8%. In India, the prevalence of affective disorder is 0.51 per thousand population to 20.78 per thousand population.[3] The first-line treatment for BPAD is pharmacotherapy whereas a combination of medications with psychotherapies has proven to lead to relatively normal and productive life in 60%–80% patients.[4] The efficacy of medications is directly related with adherence.[1] The WHO has defined treatment adherence as “The extent to which a person’s behavior taking medication, following a diet, and or executing lifestyle changes, corresponds with agreed recommendations from a health care provider.”[5] The existing...
literature suggests about 41% of patients were believed to be nonadherent to medication, ranging from 20% to 60%. In an Indian study, patient-related factors contributed for 33.5%, drug-related factors for 32% and disease-related factors for 31% of nonadherence. Nonadherence in BPAD is a complex phenomenon determined by multiple variables but its critical determinants are yet to be identified with certainty. Patient-centered variables such as attitudes and beliefs regarding medications, distress associated with side effects, substance use besides lack of family and social support, insufficient information about the disease and treatment, stigma may be more seminal influences on medication adherence in BPAD. In Indian studies, factors such as inadequate family support, economic status, distance from the hospital, ignorance of patient’s family members about illness, and comorbid substance abuse were found to be associated with nonadherence. Sharma et al. found that young patients with good social support had good adherence whereas those with severe illnesses and who had sedation side effect of medications were nonadherent. Nonadherence, unfortunately, leads to lesser syndromic recovery or longer delay to syndromic recovery, more frequent relapses or recurrences, more suicidal attempts, and higher mortality by suicides in nonadherent patients. Nonadherence is also associated with more number of hospitalizations or psychiatric emergency services use and higher inpatient care cost as well as higher global cost of the disease. Hence, by improving adherence not only morbidity and sufferings of patients and caregivers are reduced but also the cost of hospitalization is reduced significantly. Hence, it is important to systematically investigate the determinants of medication adherence so that clinicians and health-care providers can work on those factors to optimize management. In the present study, we assessed medication nonadherence in BPAD and evaluated all the associated factors in view to focus on the same before prescribing in future for improvement in adherence.

METHODS

The present study is a retrospective chart review study which was done at the Department of Psychiatry at Amrita Institute of Medical sciences over a period of 9 months. The hospital is a tertiary care center and also a teaching hospital. It is located at Kochi, Kerala. The Department of Psychiatry has both Out Patient and In Patient facilities. The hospital was established in 1998, but medical records have been computerized since 2005. In this present study, being a retrospective review study, we have included the medical record data from February 2005 to February 2019 (14 years). As per the norms, Ethical clearance was obtained from the Ethical Committee before the conduct of the study. Clinical records of 150 patients admitted during this period were accessed. Nonadherent patients were described as patients completely not taking the medications or the patients not taking at prescribed dose or frequency. In this present study, patients who were not taking medications for 1 week were considered as nonadherent. Data collection period was from September 2018 to May 2019. All patients who have been diagnosed with BPAD as per International Classification of Diseases 10 and who have been admitted at least once in the hospital and patient who need/opting prophylaxis were included for the study. Assuming alpha error at 0.5% power at 80%, considering the prevalence of nonadherence to be 60% with a precision of 10% minimum sample size estimated is 114. However, in this present study, we have included 150 patients which is the total number of patients admitted with bipolar disorder from September 2018 to May 2019.

RESULTS

The sample size consisted of 150 individuals with Bipolar disorder. The mean age of the individuals was 42.63 ± 10.557. The mean age of the males 41.49 ± 10.06 and females was 44.7 ± 11.2. The mean age of individuals who were compliant to medication was 39.85 ± 12.138 and in those with history of noncompliance was 43.21 ± 10.15. The results were statistically significant (P = 0.14). In the sample, majority were male (64.7%) and females were 35.3%. Majority of the sample was married (68.7%), majority had 6–12 years of education (46%) The other baseline socio-demographic characteristics are shown in Table 1.

Overall majority of the participants had more manic episodes (81.3%) than depressive episodes. Majority (60.7%) of the participant’s average duration of hospital stay was 2 weeks to 2 months. In the current study, it was found that majority (82.7%) had at least 1 month of history of noncompliance in the past. Regarding reasons of

| Table 1: Sociodemographic variables of patients with bipolar affective disorder |
|---------------------------------|------------------|------------------|
| Category                        | Variable         | Frequency (%)    |
| Sex                             | Male             | 97 (64.7)        |
|                                 | Female           | 53 (35.3)        |
| Marital status                  | Single           | 47 (31.3)        |
|                                 | Married          | 101 (68.7)       |
| Highest educational qualification (years) | <6            | 63 (42)          |
|                                 | 6-12             | 69 (46)          |
|                                 | >12              | 18 (12)          |
| Occupation                      | Employed         | 67 (44.7)        |
|                                 | Unemployed       | 83 (55.3)        |
| Average distance (km)           | <10              | 33 (22)          |
|                                 | >20              | 66 (44)          |
|                                 | 10-20            | 51 (34)          |
| Family history                  | First degree     | 68 (45.3)        |
|                                 | No history       | 41 (27.3)        |
|                                 | Second degree    | 41 (27.3)        |
| Chronic medical illness         | Diabetes         | 56 (37.3)        |
|                                 | Hypertension     | 31 (20.7)        |
|                                 | Hypothyroidism   | 16 (10.7)        |
|                                 | Nil              | 47 (31.3)        |
| Substance abuse                 | Alcohol          | 48 (32)          |
|                                 | Tobacco          | 44 (29.3)        |
|                                 | Nil              | 58 (38.7)        |
noncompliance, major reason was poor understanding of illness by the family (56%) and the next reason was a negative aspect of the patient toward the drug (20%). Noncompliance due to adverse effects of the drug (10.7%) and financial issues (4.7%) was less. Major adverse effect reported was weight gain. In the current study, only one patient was drug supervised. In the current study, on long-term follow-up, it was found that 64.7% were 80%–99% adherent to medications and 22.66% were 50%–79% adherent to medications overall [Table 2].

In the current study, of 150 participants taken, 103 were married, out of which 90 (87.4%) had a history of noncompliance and 34 were single and it was statistically significant ($P = 0.024$). When compared with other sociodemographic variables (sex, age, education, occupation, and family history), none of them were significant [Table 3].

In the current study, it was found that out of 150 participants, 80 (87.9%) had average hospital stay between 2 weeks to 2 months and 11 did not have a history of noncompliance, there was statistically significant association ($P = 0.003$). In the current study, of total 150 participants only 1 was on antipsychotics alone as prophylaxis, 29 on mood stabilizer, 108 were on both antipsychotics and mood stabilizers and 12 others (2 mood stabilizers ± antipsychotics). Among this, it was found that 22 (75.9%) who were on both mood stabilizer and antipsychotics had a history of noncompliance and 7 (24.1%) did not have a history of noncompliance. The statistical association was ($P = 0.242$) 60.89% (573 out of 941) of all the episodes that occurred were due to nonadherence which was statistically significant (0.04) [Table 4].

The mean of total duration of illness with a history of noncompliance was 14.44 ± 7.476. It was found to be significant ($P = 0.027$). The mean of number of episodes requiring admission with history of noncompliance was 6.63 ± 2.898 and mean number of episodes with no history of noncompliance was 4.58 ± 3.139. It was found to be statistically significant ($P = 0.001$).

**DISCUSSION**

In our study, it was found that 82.7% had history of noncompliance (minimum of at least 1 week) and it is strongly consistent with the previous studies. In a naturalistic descriptive study, 60.6% of patients have low adherence to medications.[21] Existing literature also shows that 20%–60% of bipolar disorder patients are nonadherent to medications.[5,22] The variability in rates and differences in studies are likely to be the consequence of difference in the methodology used, study setting designs, assessment of adherence, and sample size included. Despite the introduction of new medicines, the rate of nonadherence remains stable over years. In our study, the major cause of noncompliance was “poor understanding of illness by the family” and the next reason was “negative aspect of

| Category | Variable | Frequency (%) |
|----------|----------|---------------|
| Predominant episode | Depression | 26 (17.3) |
| | Mania | 122 (81.3) |
| | Mixed | 2 (1.3) |
| Duration of hospital stay | <2 weeks | 32 (21.3) |
| | 2 weeks to 1 month | 91 (60.7) |
| | >1 month | 27 (18) |
| Supervision of drugs | No | 149 (99.3) |
| | Yes | 1 (0.7) |
| Types of psychotropics | APs | 1 (0.7) |
| | MSs | 29 (19.3) |
| | AP + MS | 108 (72) |
| | AP + MS + AD | 2 (1.3) |
| | Others | 10 (6.7) |
| Any other treatment history | Ayurveda | 11 (7.3) |
| | Religious | 9 (6) |
| | Nil | 130 (86.7) |
| Frequency of follow-up | 2 weeks | 3 (2) |
| | Once a month | 103 (68.7) |
| | Once 2 months | 12 (8) |
| | Not for the past 3 months | 32 (21.3) |
| Other medications | Antihypertensives | 36 (24) |
| | Oral hypoglycemics | 43 (28.7) |
| | Thyroxine | 21 (14) |
| | Nil | 50 (33.3) |
| Adherence to nonpsychiatry medications | Yes | 83 (55.3) |
| | No | 17 (11.3) |
| | Nil | 50 (33.3) |
| Percentage of adherence | <49 | 6 (4) |
| | 50-79 | 34 (22.6) |
| | 80-100 | 97 (64.7) |
| | 100 | 13 (8.7) |

APs – Antipsychotics; MSs – Mood stabilizers; AD – Antidepressants

| Factor | Category | Yes, n (%) | No, n (%) | $P$ |
|--------|----------|------------|-----------|-----|
| Gender | Female | 41 (77.4) | 12 (22.6) | 0.204 |
| | Male | 83 (85.6) | 14 (14.4) | |
| Marital status | Married | 90 (87.4) | 13 (12.6) | 0.024 |
| | Single | 34 (72.3) | 13 (27.7) | |
| Education status (years) | <6 | 52 (82.53) | 11 (17.4) | 0.981 |
| | 6-12 | 57 (82.6) | 12 (17.4) | |
| | >12 | 15 (83.3) | 3 (16.7) | |
| Occupation | Unemployed | 68 (81.9) | 15 (18.1) | 0.656 |
| | Employed | 56 (83.5) | 11 (16.4) | |
| Family history | First degree | 59 (86.8) | 9 (13.2) | 0.462 |
| | Second degree | 33 (80.5) | 9 (22) | |
| | Nil | 32 (78) | 8 (19.5) | |
| Chronic medical disease | Diabetes | 49 (87.5) | 7 (12.5) | 0.55 |
| | Hypertension | 26 (83.9) | 5 (16.1) | |
| | Hypothyroidism | 12 (75) | 4 (25) | |
| | Nil | 37 (78.7) | 10 (21.3) | |
| Substance use | Alcohol | 43 (89.6) | 5 (10.4) | 0.17 |
| | Tobacco | 37 (84.1) | 7 (15.9) | |
| | Nil | 44 (75.9) | 14 (24.1) | |
| Average distance of home from hospital (km) | <10 | 30 (90.9) | 3 (9.1) | 0.223 |
| | 10-20 | 43 (84.3) | 8 (15.7) | |
| | >20 | 51 (77.3) | 15 (22.7) | |

Table 2: Distribution of other variables in patients of bipolar affective disorder

Table 3: The association of sociodemographic variables with a history of noncompliance
Table 4: The association of other variables with a history of noncompliance

| Factor                  | Category | Yes, n (%) | No, n (%) | P     |
|-------------------------|----------|------------|-----------|-------|
| Predominant episode     | Depression | 19 (73.1) | 7 (26.9)  | 0.155 |
|                         | Mania    | 104 (85.2) | 18 (14.8) |       |
|                         | Mixed    | 1 (50)     | 1 (50)    |       |
| Duration of hospital    | <2       | 20 (62.5)  | 12 (37.5) | 0.003 |
|                         | 2 weeks to 1 month | 80 (87.9) | 11 (12.1) |       |
|                         | >1 month  | 24 (88.9)  | 3 (11.1)  |       |
| Supervision of drugs    | No       | 124 (83.2) | 25 (16.8) | 0.028 |
|                         | Yes      | 0           | 1 (100)   |       |
| Types of psychotropics  | APs      | 1 (100)    | 0         | 0.242 |
|                         | MSs      |             |           |       |
|                         | AP + MS  | 93 (86.1)  | 15 (13.9) |       |
|                         | Others   | 8 (66.6)   | 4 (33.3)  |       |
| Any other treatment history | Ayurveda | 11 (100) | 0         | 0.276 |
|                         | Religious | 7 (77.8) | 2 (22.2)  |       |
|                         | Nil      | 106 (81.5) | 24 (18.5) |       |
| Frequency of follow-up  | 2 weeks  | 3 (100)    | 0         | 0.286 |
|                         | Once a month | 88 (85.4) | 15 (14.6) |       |
|                         | Once 2 months | 10 (83.3) | 2 (16.7)  |       |
|                         | Not for past 3 months | 23 (71.9) | 9 (28.1)  |       |
| Other medications       | Anti hypertensives | 29 (80.6) | 7 (19.4)  | 0.069 |
|                         | Oral hypoglycemics | 40 (93.3) | 3 (7)     |       |
|                         | Thyroxine | 14 (66.7) | 7 (33.3)  |       |
|                         | Nil      | 41 (82)    | 9 (18)    |       |
| Adherence to nonpsychiatry medications | No | 55 (85.9) | 9 (14.1)  | 0.361 |
|                         | Yes      | 69 (80.2)  | 17 (19.8) |       |
| Number of episodes requiring admission | <5 | 66 (74.2) | 23 (25.8) | 0.04  |
|                         | 5-10     | 56 (94.9)  | 3 (5.1)   |       |
|                         | >10      | 2 (100)    | 0         |       |

APs – Antipsychotics; MSs – Mood stabilizers

In our study, it was found that though 82.7% of patients had a history of noncompliance of at least 1 week but when compared with the total duration of disorder with nonadherence, we found that 64.7% patients had more than 80% adherence. It might be because of the psychoeducation given about the disorder during OP visit during which the patient’s insight could have been improved. In our study, the majority of the patients follow-up was once in a month, which was helpful in maintaining good patient–doctor alliance. In our study, majority of the patients were on both mood stabilizers and antipsychotics but the number of psychotropics used did not show any significant association with adherence.

In our study, it was found that mean of the total duration of illness was higher in patients who are nonadherent to medications. In this present study, it was also found that mean number of episodes was more in patients who have history of noncompliance than in patients who have no history of noncompliance none of the previous studies has shown any correlation with the duration of illness. However, it might be due to fact that patient nonadherence leads to more episodes and longer duration of need for prophylaxis.

Major limitation of the study was it was a retrospective chart review study; therefore, it lacked clarity or details of the reasons for nonadherence. The entire sample was obtained from a single hospital located in an urban area and this may not generalize the settings. We have not assessed the adherence rate of various mood stabilizers were married or have adequate family support attitude by family toward the patients and their medication might affect nonadherence. A previous study showed higher education and higher number of days in the hospital showed higher adherence.\[21\] Higher duration of inpatient stay offers more opportunities of psychoeducation and clarification of medication-related benefits.\[21\] Contrary to the existing literature, in our study patients whose average duration of stay in the hospital was more than a month were found to have significant association with nonadherence. This may be due to the fact that despite providing adequate psycho-education to the patient and family members, patients had nonadherence to medications might be due to poor insight at the time of discharge. In our study, most of the patients’ highest educational qualification was only secondary level of education and this might have also contributed in poor understanding of the disease model and the importance of taking prophylactic medication. In our study, most of the patients stayed more than 20 km from the hospital and were unemployed. It was found to have no association with nonadherence. In a similar study done by Hayanes et al., 2008[28] Karaytug et al.,[10] that race, ethnicity, gender, education, occupation, and income do not have significant effect on adherence.

In our study, most of the participants were males. No association was found on either sex. Studies showing no association with gender have been previously published.[14,25] In our study, none of the sociodemographic factors were associated with nonadherence except for being married. Similarly, Zito et al. reported that marriage has significant association with poor compliance.[26] This was in contrary to the previous studies which showed single, young, socially isolated individuals are more prone for nonadherence.[27] The reason might be younger people might live with the parents in our country who will be more authoritative than spouse. Therefore, it gives an idea that even if the patients...
or antipsychotics (first-generation vs. second-generation) separately. In this present study other psychiatric co morbidities, past history of suicide, electroconvulsive therapy treatment, socioeconomic status was not included which is a drawback; previous studies showed that low socioeconomic status was associated with nonadherence. In the study, since it was retrospective, physician-related factors (patient–physician relationship and communication) were not assessed. Since the study was done in a tertiary care center located in an urban area many patients visit from various rural parts of Kerala, the cultural beliefs of those patients were not assessed which might have played a role.

CONCLUSION

Therefore, this study concludes that though the majority of the patients have a history of nonadherence of at least 1 week on long-term follow-up it was seen that majority of the patients were more than 80% adherent to medications. It is important that clinician should consider the patient’s preferences while deciding on the drug and adopt a shared decision making.[26] It is always better to use a simple medication regime and to manage the side effects in the patients effectively. It is also important to clear all the doubts regarding the treatment and always encourage family supervision. The clinician should also focus on targeted psychoeducation about illness and more specifically about medication-related benefits and should improve the attitude toward medications.[21] The role of technology in medication adherence, pill count on review follow-up sending reminders about review date, will be more useful in improving medication adherence not only in Bipolar disorder but in various other psychiatric disorders as well.[21‑33]

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Karayutug MO, Keskin N, Tamam L, Ozpoyraz N, Demirkol ME, Gurbuz M. Assessment of treatment adherence in patients with bipolar disorder. J Mood Disord 2017;7:185-90.
2. Swaroopachary RS, Kalasapati LK, Ivaturi SC, Reddy CM. Disability in bipolar affective disorder patients in relation to the duration of illness and current affective state. Arch Ment Health 2018;19:37-.
3. World Health Organization. Adherence to Long Term Therapy: Evidence for Action. Geneva: World Health Organization; 2003.
4. Leboyer M, Kupfer DJ. Bipolar disorder: New perspectives in health care and prevention. J Clin Psychiatry 2010;71:1689-95.
5. Lingam R, Scott J. Treatment non-adherence in affective disorders. Acta Psychiatr Scand 2002;105:164-72.
6. Lucca JM, Ramesh M, Parthasarathi G, Ram D. Incidence and factors associated with medication nonadherence in patients with mental illness: A cross-sectional study. J Postgrad Med 2015;61:251-6.
7. Chakrabarti S. Treatment-adherence in bipolar disorder: A patient-centred approach. World J Psychiatry 2016;6:399-409.
8. Roy R, Jahan M, Kumar S, Chakrabotry PK. Reasons for drug non-compliance of psychiatric patients: A centre based study. J Indian Academy Appl Psychol 2005;2:24-8.
9. Weiss RD, Ostacher MJ, Otto MW, Calabrese JR, Fossey M, Wisniewski SR, et al. Does recovery from substance use disorder matter in patients with bipolar disorder? J Clin Psychiatry 2005;66:730-5.
10. Sultan S, Chary S, Vemula S. A study of Non-compliance with pharmacotherapy in Psychiatry patients. AP Psychol Med 2014;15:81-5.
11. Sharma S, Kumar N, Chakraborti S, Sinha S, Kumar S, Gajendragad JM. Prevalence and factors associated with medication compliance in Indian patients suffering from mental disorders. Trop Doct 2012;42:28-31.
12. Colom F, Bowskill R, Parham R, Rank T, Scott J, Horne R. Understanding medication non-adherence in bipolar disorders using a Necessity-Concerns Framework. J Affect Disord 2009;116:51-6.
13. Gutiérrez-Rojas L, Jurado D, Martínez-Ortega JM, Gurreguel M. Poor adherence to treatment associated with a high recurrence in a bipolar disorder outpatient sample. J Affect Disord 2010;127:77-83.
14. Svarstad BL, Shireman TI, Sweney JK. Using drug claims data to assess the relationship of medication adherence with hospitalization and costs. Psychiatr Serv 2001;52:805-11.
15. Miasso AI, Monteschi M, Giaccheri KG. Bipolar affective disorder: Medication adherence and satisfaction with treatment and guidance by the health team in a mental health service. Rev Lat Am Enfermagem 2009;17:549-66.
16. Frikalanis S, Risser J, Gatti ME, Jacobson TA. Development and evaluation of the Adherence to Refills and Medications Scale (ARMS) among low-literacy patients with chronic disease. Value Health 2009;12:118-23.
17. Ruber M, Copeland LA, Good CB, Fine MJ, Bauer MS, Kilbourne AM. Therapeutic alliance perceptions and medication adherence in patients with bipolar disorder. J Affect Disord 2008;107:53-62.
18. Adams SG Jr, Howe JT. Predicting medication compliance in a psychotic population. J Nerv Ment Dis 1993;181:558-60.
19. Bubbling TN. The content and context of compliance. Int Clin Psychopharmacol 1995;9 Suppl 5:41-50.
20. Offson M, Mechanic D, Hansell S, Boyer CA, Walkup J, Weiden PJ. Predicting medication noncompliance after hospital discharge among patients with schizophrenia. Psychiatr Serv 2000;51:216-22.
21. Selvakumar N, Menon V, Kattimani S. A cross-sectional analysis of patterns and predictors of medication adherence in bipolar disorder. Single center experience from South India. Clin Psychopharmacol Neurosci 2018;16:168-75.
22. Colom F, Vieta E, Tacchi MJ, Sánchez-Moreno J, Scott J. Identifying and improving non-adherence in bipolar disorders. Bipolar Disord 2005;7 Suppl 5:24-31.
23. Mert DG, Turgut NH, Kelleci M, Semiz M. Perspectives on reasons of medication nonadherence in psychiatric patients. Patient Prefer Adherence 2015;9:87-93.
24. Scott J, Pope M. Nonadherence with mood stabilizers: Prevalence and predictors. J Clin Psychiatry 2002;63:384-90.
25. Baldessarini RJ, Perry R, Pike J. Factors associated with treatment nonadherence among US bipolar disorder patients. Hum Psychopharmacol 2008;23:95-105.
26. Zito JM, Routt WW, Mitchell JE, Roeig JL. Clinical characteristics of hospitalized psychotic patients who refuse antipsychotic drug therapy. Am J Psychiatry 1985;142:822-6.
27. Scott J. Using Health Belief Models to understand the efficacy-effectiveness gap for mood stabilizer treatments. Neuropsychobiology 2002;46 Suppl 1:13-5.
28. Haynes RB, McKitton KA, Kanani R. Systematic review of randomised trials of interventions to assist patients to follow prescriptions for medications. Lancet 1996;348:383-6.
29. Keck PE Jr, McElroy SL, Strakowski SM, Bourne ML, West SA. Compliance with maintenance treatment in bipolar disorder. Psychopharmacol Bull 1997;33:87-91.
30. Perlis RH, Ostacher MJ, Miklowitz DJ, Hay A, Nierenberg AA, Thase ME, et al. Clinical features associated with poor pharmacologic adherence in bipolar disorder: Results from the STEP-BD study. J Clin Psychiatry 2010;71:296-303.
31. Hall AK, Cole-Lewis H, Bernhardt JM. Mobile text messaging for health: A systematic review of reviews. Annu Rev Public Health 2015;36:393-415.
32. Erdogan Sarabi R, Sadoughi F, Jamshidi Orak R, Bahadimbasy K. The effectiveness of mobile phone text messaging in improving medication adherence for patients with chronic diseases: A systematic review. Iran Red Crescent Med J 2016;18:e25183.
33. El-Mallakh P, Findlay J. Strategies to improve medication adherence in patients with schizophrenia: The role of support services. Neuropsychiatr Dis Treat 2015;11:1077-90.