

Seasonal Variation in Psychiatric Disorders Among Patients Admitted at Armed Forces Institute of Mental Health Rawalpindi

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ABSTRACT

Objective: To determine the seasonal variation in psychiatric disorders among patients admitted to the Armed Forces Institute of Mental Health.

Study Design: Retrospective longitudinal study.

Place and Duration of the Study: Armed Forces Institute of Mental Health Rawalpindi from Jun 2014 to May 2019.

Methodology: A total of 3120 cases diagnosed according to ICD-10 criteria were included after evaluating a 5-year indoor hospital record. Around 30 psychiatric disorders among males and females aged 12-65 were included. Cases of adjustment disorder in the military and those without any diagnosis were excluded. Disorders were allocated to 4 seasonal groups according to the months of admission, and Seasonal variation among them was evaluated.

Results: The 5-year disease burden showed predominance for bipolar affective and depressive disorder with 887 (28.4%) and 728 (23.3%) frequency, respectively. The higher number of admissions 825 (26.4%) took place in autumn, followed by 809 (25.9%) in winter. Admissions for the depressive disorder were highest during autumn 212 (29.1%). Peak admissions in winter included bipolar affective disorder 233 (29.53%), acute mania 23 (36.5%), and mania with psychosis 12 (34.28%). Psychotic disorders like schizophrenia and schizoaffective disorder were found prevalent in 2 seasons, 76 (26.0%) during the autumn and winter seasons each and 14 (29.0%) during the autumn and spring season each, respectively. Delusional disorder 4 (50.0%), paranoid psychosis 10 (45.0%) and acute and transient psychosis 17 (34.6%), and disorders with physical symptoms like dissociative 23 (36.0%) and conversion disorder 5 (33.0%), were especially widespread during spring.

Conclusion: Significant seasonal variation exists among various psychiatric disorders.

Keywords: Patients, Psychiatric disorder, Seasonal variation.

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INTRODUCTION

Changing climatic conditions and associated seasonal variation has become a big challenge these days, and its consideration with a thorough understanding of its impact on mental health has been a topic of interest in public health globally.^{1,2} Although in place for many years, this recognition is not well studied and the results produced are intangible despite the clear association between the variability in seasons and its influence on mental health.^{3,4}

The psychiatric field has been studying this link for quite some time, but the lag in research is speculating a public health challenge in future, especially with climate change all over the globe. Therefore, the Eco psychiatry branch needs support with new studies and data set.^{5,1} The major roadblocks identified in the research establishing a link between seasonality and

psychiatric condition are differences in geographical latitudes, like northern and southern hemispheres. This requires a strong need to research different parts of the world with climatic or seasonal differences.⁴ The theory of seasonal impact on biological functions is substantiated by some studies.⁶ The impact includes the reactionary change in behaviour and psychological and emotional well-being that could lead to psychiatric illness.³

It has been postulated that environmental factors like seasonal change can cause congenital or neuro-developmental defects.⁷ Similarly, meteorological factors such as daylight duration, mean temperature, atmospheric pressure and humidity can trigger endogenous mental conditions by changes in neurotransmitter level.³ Serotonin, for instance, increases with exposure to bright light. The interaction of neurotransmitters like serotonin with dopamine, adrenaline and GABA, therefore, is responsible for overall brain homeostasis.⁶ and their imbalance could result in a psychiatric disorder.

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Our study aimed to establish the strength of association between seasons and psychiatric disorders. The rationale behind this is to predict disease patterns with changing seasons. This would help us with future planning and initial efforts to provide better mental health care through good management of resources within the healthcare system. The improvement will therefore be brought not only in our local psychiatric or primary health care facilities with overall bene-
 fication to psychiatric patients but will also contribute globally by providing data on this subject. This study will therefore serve as an important step towards creating awareness in this regard and hence shall pave the way for further research.

METHODOLOGY

This 5-year retrospective longitudinal study based on a hospital record of 3120 indoor cases was conducted from June 2014 to May 2019 at Armed Forces Institute of Mental Health, Rawalpindi Pakistan. The study was carried out after approval from the Ethical Committee (ERC no 2019-001).

Inclusion Criteria: Over 30 psychiatric disorders, diagnosed according to (International Classification of Disease) ICD-10 criteria, males and females and age range 16 - 65 with six age groups were included in the study.

Exclusion Criteria: Individuals admitted with an established adjustment disorder and individuals not given any diagnoses during admission were excluded from the study.

The selected diagnosed cases were allocated to seasonal groups, namely spring (March-May), summer (June-August), autumn (September-November) and winter (December-February), according to the month in which they were admitted. The months were allocated to respective seasonal groups according to the Northern hemisphere seasonal classification. Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Qualitative variables like age groups, gender, marital status and psychiatric disorders were measured in frequencies and percentages.

RESULTS

Out of the total 3120 cases, the majority (1068, 34.2%) belonged to the age group (20-29), with 67.1% males and 57.8% married, showing overall predominance as shown in Table-I.

The 5-year disease burden recorded the highest frequency, 887 (28.4%) cumulatively for all kinds of

bipolar affective disorder, 728 (23.3%) for depressive disorders and 630 (20.2%) for all cases of substance dependence, making the bulk of disease burden. For disorders like schizophrenia and other psychotic illnesses, there was a total of 417 (13.4%) cases. Anxiety and stress-related disorders were 5.6%, followed by somatoform, dissociative and conversion disorders, collectively marking 2.7% of total cases, as shown in Table-II.

A slight preponderance of psychiatric admissions, 26.4%, was found during autumn, followed by 25.9% in winters, 25.5% in spring and the lowest admissions, 22% in summer.

Table-I: Demographic Characteristics of patients with Psychiatric Disorders (n=3120)

Study Parameters	Frequency (%)
Age Groups	
12-19 years	267 (8.6)
20-29 years	1068 (34.2)
30-39 years	887 (28.4)
40-49 years	491 (15.7)
50-59 years	275 (8.8)
60-65 years	132 (4.2)
Gender	
Male	2095 (67.1)
Female	1025 (32.0)
Marital Status	
Single/separated/divorced/widower	1317 (42.2)
Married	1803 (57.8)

Detailed analysis of the frequency of psychiatric disorders admitted during each season shown in Table-III identified anxiety and stress-related disorders like adjustment, generalized anxiety and obsessive-compulsive disorder were most commonly admitted during autumn with the frequency of 22, 24 and 7, respectively. Depressive disorders without psychosis were also prevalent during autumn with a frequency of 179, followed by spring 152, while depression with psychosis was commonly admitted both in autumn and winter, showing an equal frequency of 26 each season. Other mood disorders like bipolar affective disorder (30%), acute mania (36.5%) and mania with psychosis (34.2%) were identified to be admitted more frequently in winter, followed by spring.

Psychotic disorders were common during autumn, spring and winter but were found highest in the former. Schizophrenia among them was found with a uniform frequency of 76 during autumn and winter, followed by 72 in spring, whereas schizoaffective disorder had an equal admission rate of 14 (29.78%) during autumn and spring each. Delusional

disorder (50%), paranoid psychosis (45%), and acute and transient psychosis (34.6%) further added up to the major bulk of psychotic disorders during the spring season.

Table-II: Five-year indoor Disease Burden of various Psychiatric Disorders (n=3120)

Disease	Frequency (Percentage)
Alcohol dependence	5 (0.2)
Opioid dependence	210 (6.7)
Cannabis dependence	64 (2.1)
Cannabis induced psychosis	87 (2.8)
Stimulant induced psychosis	4 (0.1)
Polysubstance use	260 (8.3)
Schizophrenia	291 (9.3)
Delusional disorder	8 (0.3)
Acute and transient psychosis	49 (1.6)
Paranoid psychosis	22 (0.7)
Schizoaffective disorder	47 (1.5)
Acute mania	63 (2.0)
Bipolar affective disorder	789 (25.3)
Mania with psychosis	35 (1.1)
Depressive disorder	596 (19.1)
Depression with psychosis	92 (2.9)
Depression with dissociation	40 (1.3)
Panic disorder	15 (0.5)
Generalized anxiety disorder	54 (1.7)
Obsessive compulsive disorder	16 (0.5)
Acute stress reaction	25 (0.8)
Adjustment disorder	31 (1.0)
Mixed anxiety and depressive disorder	33 (1.1)
Dissociative disorder	6 (2.0)
Conversion reaction	15 (0.5)
Somatoform disorder	5 (0.2)
Postpartum depression	54 (1.7)
Personality disorder	53(1.7)
Mental retardation	9 (0.3)
ASD/ADHD	2 (0.1)
Other (DSH, personality traits, dystonia, eating disorder, grief reaction, dementia, dystonia)	4 (1.4)
Organic	3 (1.18)

Disorders with physical symptoms like Somatoform (40%), dissociative (36%) and conversion disorder (33%) were also commonly admitted during the spring season. Cases of Substance dependence and personality disorders were admitted with equal prevalence during four seasons.

DISCUSSION

The current study has highlighted the overall disease burden of psychiatric disorders and their predominance for age group, gender, marital status, and seasons.

A local study by Nawaz *et al.* in 2020 has shown the predominance of male gender and married marital status, similar to findings in our study. The study has also identified most indoor cases diagnosed with bipolar affective disorder followed by depressive disorder, substance use disorder, and psychotic disorders like schizophrenia,⁸ which is in total conformity with our results identified over five years.

According to a study in Bosnia, a maximum number of psychiatric admissions took place during the months of autumn and winter, making 28% each, followed by 26% in spring and 20% in summer.⁹ An almost similar seasonal trend was also seen in our study, with the predominance of psychiatric admissions 26.44% during autumn, followed by 25.9% in winters and 25.5% in spring.

Keller *et al.* in 2005, found that better mood and memory were associated with warmer days, which could be due to the opportunity to spend more time outside during summers compared to winters.¹⁰ Therefore, the result of this study conducted in Canada, a zone with a temperate climate like ours, is consistent with our study result with the lowest admissions during summer.

The inconsistency in most of the studies' results is attributable to considering single weather variables like temperature, humidity, or daylight duration. All these meteorological factors depend on each other in terms of overall impact.¹¹

A study by Jahan *et al.* in 1991 highlighted a link between seasonal factors such as (low atmospheric pressure and reduced daylight exposure) to abnormal dopamine and serotonin levels that could change the circadian rhythm and possibly lead to mood alteration and behavior.¹² Therefore, the evidence of variation in neurotransmitter levels due to changing seasons has been positively linked with the periodicity of psychiatric disorders and hence hospital admissions.⁴

Anxiety disorders are frequently diagnosed with a lifetime prevalence, 29% among the general population.¹³ A Mexican study in 2019 observed a rise of anxiety-related disorders in autumn at 26.6%, followed by summer 25.3% and spring at 24.9%.⁶ A similar study in India by Singh *et al.* in 2013 identified an increased frequency of consultations for anxiety-related disorders in autumn and summer.¹⁴

More studies in this regard found a peak of prevalence for anxiety disorders in any month,³ however, a Turkish study by Tan *et al.* in 2016 revealed

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that in anxiety disorders like OCD, the duration of sunlight was associated with compulsions, making them more common during fall.¹⁵

Bulbena *et al.* in 2005, carried out a study in Spain whereby he found that most of the episodes of non-panic anxiety disorders presented during autumn and

In a classic piece of writing by Burton in 1681, autumn was called a most melancholic season.¹³ A study conducted in New Zealand (Southern hemisphere) in 1995 compared two cohorts of depressed patients, one from London and another from New Zealand, to identify the seasonality and observed the

Table-III: Five-year frequency of Psychiatric Disorders Admitted during each Season ((n=3120))

Disease	Summer	Autumn	Winter	Spring
Alcohol dependence	0 (0)	0 (0)	3 (60.0)	2 (40)
Opioid dependence	58 (27.6)	49 (23.3)	46 (21.9)	57 (27.1)
Cannabis dependence	11 (17.2)	19 (29.6)	17 (26.5)	17 (26.5)
Cannabis induced psychosis	17 (19.5)	17 (19.5)	32 (36.8)	21 (24.1)
Stimulant induced psychosis	1 (25.0)	0(0)	2 (50.0)	1 (25.0)
Polysubstance use	67 (25.7)	75 (28.8)	57 (21.9)	61 (23.4)
Schizophrenia	66 (22.6)	76 (26.1)	77 (26.4)	72 (24.7)
Delusional disorder	1 (12.5)	2 (25.0)	1 (12.5)	4 (50.0)
Acute and transient psychosis	9 (18.3)	14 (28.5)	9 (18.4)	17 (34.7)
Paranoid psychosis	3 (13.6)	3 (13.6)	6 (27.3)	10 (45.5)
Schizoaffective disorder	11 (23.4)	14 (29.8)	8 (17.0)	14 (29.8)
Acute mania	8 (12.7)	13 (20.6)	23 (36.5)	19 (30.2)
Bipolar affective disorder	172 (21.7)	188 (23.8)	233 (29.5)	196 (24.8)
Mania with psychosis	10 (28.6)	9 (25.7)	12 (34.3)	4 (11.4)
Depressive disorder	124 (20.8)	179 (30.0)	141 (23.6)	152 (25.5)
Depression with psychosis	16 (17.3)	26 (28.3)	26 (28.2)	24 (26.1)
Depression with dissociation	15 (37.5)	7 (17.5)	10 (25.0)	8 (20.0)
Panic disorder	4 (26.6)	2 (13.3)	4 (26.6)	5 (33.3)
Generalized anxiety disorder	4 (7.04)	24 (44.4)	8 (14.8)	18 (33.3)
Obsessive compulsive disorder	2 (12.5)	7 (43.7)	2 (12.5)	5 (31.1)
Acute stress reaction	9 (36.0)	7 (28.0)	5 (20.0)	4 (16.0)
Adjustment disorder	7 (22.5)	15 (25.49)	6 (19.4)	3 (9.7)
Mixed anxiety and depressive disorder	10 (30.3)	11 (33.3)	10 (30.3)	2 (6.01)
Dissociative disorder	14 (22.2)	11 (17.4)	15 (23.8)	23 (36.5)
Conversion reaction	3 (20.0)	4 (26.6)	3 (20.0)	5 (33.3)
Somatoform disorder	1 (20.0)	1 (20.0)	1 (20.0)	2 (40.0)
Postpartum depression	15 (27.7)	16 (29.6)	10 (18.5)	13 (24.1)
Personality disorder	14 (26.4)	13 (24.5)	11 (20.7)	15 (28.3)
Mental retardation	4 (44.4)	1 (11.1)	2 (22.2)	2 (22.2)
ASD/ADHD	0(0)	0(0)	0(0)	2 (100)
Other (DSH, personality traits, dystonia, eating disorder, grief reaction, dementia)	5 (10.8)	9 (19.5)	20 (43.4)	12 (26.1)
Organic	7 (18.4)	13 (34.2)	9 (24.32)	8 (21.62)
Total	688 (22.1)	825 (26.4)	809 (25.9)	798 (25.5)

spring seasons, while the panic attacks were frequently linked with warm Poniente wind spring/summer season. This study ensured precision in that panic and non-panic anxiety disorders were studied separately due to their difference in clinical and biological theme.¹⁶ The results of these studies were mostly consistent with current findings, which also observed that GAD and OCD are most prevalent during autumn followed by spring, whereas panic disorder is common during spring followed by summers and winters.

peak of depressed cases in both groups during the autumn season.¹⁷

Previous studies, mostly done in the Northern hemisphere, have shown inconsistent results for seasonal variation in depression.

A study from Japan by Lee *et al.* in 2010 revealed a trend of depression in the early winter and early spring season,¹⁸ while a study done in Italy by Aguglia *et al.* in 2015 observed that depressive episodes peak during early winter and, to a lesser extent, in sum-

mer.¹⁹ Another study in Vietnam 2015 showed a biannual peak in both autumn and summer, contrary to previous findings in its own country with a peak of depression in autumn or spring.⁴ Similarly, a study by Licanin *et al.* in Bosnia in 2012 showed that depressive disorders are most prevalent during spring.⁹

All of these results were somewhat consistent with our finding in which patients with depressive disorders were mostly admitted during autumn followed by spring, while the cases of severe depression with psychosis presented equally during autumn and winter. The difference in overall results could be due to data collected from indoor hospital records associated with disease severity.

Previous research on seasonality for mania revealed that neurobiological variations related to the photoperiod caused a peak in admissions due to specific photoperiod length from February through March (winter/spring),⁴ in conformity with our study results whereby highest bipolar cases were admitted during winter and spring season.

Many studies from the Northern hemisphere showed maximum admissions for bipolar disorder in the winter months,¹⁷ including a Turkish study in 2018 showing worsening symptoms of the seasonal disorder, a subtype of Bipolar disorder in winters.³ Similarly Indian study by Rajkumar *et al.* in 2015 for bipolar disorder found the highest admissions during monsoon, winter and spring.²⁰

Studies from the Southern hemisphere, including two subsequent studies in Brazil by Volpe *et al.* in 2006/2010,²¹ and an Australian study by Parker *et al.* in 2016, revealed the highest admissions for bipolar disorder during the winter and spring seasons.²²

Some inconsistent study results compared to ours included an Italian study by Andre *et al.* in 2015, which found the peak of bipolar admission during May, June and July 19, similar to some European countries with a predominance of these cases during summer and spring.⁴ While a study in Egypt showed the highest case of mania hospitalized in June and December 4, a Bosnian study revealed mood disorder peaking in spring and autumn,⁹ non-conformant with our results.

The end of the 18th century is marked by observation regarding seasonal patterns in the severity of schizophrenia. However, many studies gave conflicting results.²³

A study from both the Southern hemisphere in Australia and the Northern hemisphere in China

observed peak admissions for schizophrenia during months with the shortest photoperiod in a day, representing a winter season.²³ Another study in Australia in 2021 depicted an overall peak in admission for schizophrenia during winter compared with autumn and the lowest in summer.¹² These results were consistent with our findings for schizophrenia, which existed mostly during winter, followed by the autumn season.

An Austrian study, however, showed mixed results when compared with ours as their admissions with schizophrenia peaked in January (winter) and June (summer) season.²³ Similarly, a large study conducted in Tel Aviv identified the highest admission rate for the schizoaffective disorder during autumn,²⁴ similar to our findings that equally depicted higher admissions for the schizoaffective disorder during autumn and spring.

Our findings for the prevalence of other psychotic disorders during spring were further supported by a study conducted in Bosnia, whereby the highest frequency of admission for psychotic disorders was found to be 27%, maximum during spring.⁹

Concerning somatoform disorder, a local study by Habib *et al.* in 2018 identified the highest presentation of patients with this disorder during the spring season,²⁵ in conformity to our results.

No specific seasonality was observed in our locality for substance dependence disorders, a finding supported by a Bosnian study, whereby admissions for substance dependence were prevalent through all seasons.⁹

However, our study's findings have added important information to the medical literature by revealing the predominance of anxiety and depression in autumn, the peak of bipolar episodes in winter and psychotic symptoms in spring. This word will spread awareness among patients, their families and health care providers regarding the likelihood of relapse of these major disorders during specific seasons. In addition, it will further help them deal with the severity of the disease or even prevent the recurrence by ensuring adherence to treatment and regular psychiatric follow-ups during the preceding months.

LIMITATION OF STUDY

Limitations included non-consideration of the duration of onset of symptoms, limiting our results for seasonal variability mostly seen in severity of disease leading to admissions. Moreover, socioeconomic status and history of trauma or disaster were not considered during data collec-

tion, which could influence the results. However, it was recognized that no major disaster happened in the locality during the selected 5-year period of study.

Another limitation was data collection from a single psychiatric facility. Therefore, the results could not be generalized nationwide due to the diversity of seasons in our country.

CONCLUSION

Our study found significant seasonal variation among anxiety, depression, bipolar, psychotic, and disorders with physical symptoms like somatoform, dissociative and conversion disorder. The findings prove that seasonality in the form of temperature and daylight duration can alter the balance of neurotransmitters in the brain and, along with other factors, not only serve as the basis of psychiatric disorders but also impact the severity of disease leading to hospitalization.

Conflict of Interest: None.

Author's Contribution

NS:, RQ:, SMAH: Direct contribution, SS: Interpretation of data, SU: Design analysis, AH: Intellectual concept.

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