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Nicole Ann E. Villa
Drexel University College of Medicine at Tower Health

Matthew Driben
Reading Hospital - Tower Health

Regina Reed
Reading Hospital, Tower Health

Maria Yee
Reading Hospital, Reading

Eduardo Espiridion
Reading Hospital - Tower Health

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Nicole Ann E. Villa[1], Eduardo Espiridion[2], Maria Ruiza Yee[2], Regina Reed[2]

1 Drexel University College of Medicine at Tower Health, West Reading, PA
2 Department of Psychiatry, Reading Hospital-Tower Health, West Reading, PA

ABSTRACT

INTRODUCTION: Coronavirus (COVID-19) infection has spread globally and resulted in more than one million deaths in the US as of July 2023, where it has been more severe in psychiatric wards. State hospitals are a particularly transmissible location for COVID-19, and the medications that psychiatric patients typically utilize may contribute to the incidence of comorbidities including obesity, hypertension, and diabetes. Studies have found that patients with preexisting mental health disorders and comorbidities tend to have worse COVID-19 outcomes. Thus, we examine the mortality and comorbidity rate of patients, and discuss how psychiatric medications may contribute to the risk of COVID-19 outcomes for psychiatric patients in a state hospital.

METHODS: We performed a retrospective study on 24 patients in a psychiatric state hospital who are above 18 years old, tested positive for COVID-19, and experienced symptoms severe enough to be admitted to a community hospital between April 1, 2020, to June 30, 2022. Patients with multiple COVID-19 admissions to the hospital during this period were excluded if the period between admissions was less than two weeks.

RESULTS: The patients had an average (IQR) age of 57.75 (48-64) and 2.12 (2-3) comorbidities. The most common psychiatric disorders were schizoaffective disorder (70.8%), schizophrenia (29.2%), and delirium (29.2%). For comorbidities, patients most commonly presented with hypertension (54.2%), chronic kidney disease (41.2%), diabetes (33.3%), and obesity (33.3%) upon admission. The most common psychiatric medications during admission for COVID-19 were antipsychotics (83.3%), mood stabilizers (54.2%), and antidepressants (54.2%).

CONCLUSION: Though our study is qualitative in nature, it is meant to shed light on conditions that may precipitate the worsening of COVID-19 infection in hospitalized psychiatric patients. We recommend additional studies in order to have a comprehensive understanding of the extent to which psychiatric medications result in worse COVID-19 outcomes due to comorbidities.

Correspondence to Nicole Ann Villa at
Nv366@drexel.edu

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INTRODUCTION

Patients with serious mental illness are usually the patients admitted in a state psychiatric hospital. Serious mental illness (SMI) is defined by the National Institute of Mental Health (NIMH) as a mental, behavioral, or emotional disorder resulting in a serious functional impairment which substantially interferes with or limits one or more major life activities.[1] Patients with SMI experience highly intractable psychiatric symptoms and great level of dysfunction from their mental illness, making them a vulnerable population. Patients with psychiatric disorder have a shortened lifespan compared to the general population, as much as 10 to 15 years.[2] In addition to their debilitating psychiatric symptoms, patients with SMI have comorbid medical conditions such as cardiovascular disease, diabetes mellitus, obesity, hyperlipidemia, hypertension, bronchial asthma, and chronic obstructive pulmonary diseases.[3] Several studies have shown that patients with psychiatric disorders are more susceptible to coronavirus (COVID-19) infection and increased mortality rate because of it.[4-6] Patients with psychiatric disorders have a death rate of 8.5% versus 4.7% among COVID-19 patients with no psychiatric condition and a hospitalization rate of 27.4% versus 18.6% among COVID-19 patients with no mental disorders.[6] The use of psychotropic medications can either improve or worsen the prognosis of a COVID-19 infection.[7] This is an important factor to consider when exploring mortality and comorbidities associated with COVID-19 infection among patients

TABLE 1. Categorization of Prescribed Psychiatric Medications

Prescribed Medication Categories

Antipsychotic Medication	Anticholinergic Medication	Antidepression Medication	Benzodiazepine Medication
Aripiprazole Chlorpromazine HCl Clozapine Haloperidol Lurasidone HCl Olanzapine Paliperidone Quetiapine Fumarate	Benztropine	Fluoxetine Levomilnacipran Mirtazapine Sertraline Trazodone	Clonazepam Diazepam Lorazepam
Mood Stabilizing Medication	**Alzheimer's Medication**	**Opiate Antagonist Medication**	**Other Medications**
Lamotrigine Oxcarbazepine Topiramate Valproate	Memantine HCl	Naltrexone	Buspirone Gabapentin

from a state psychiatric hospital.

COVID-19 infection has resulted in the death of millions of people all over the world, where greater than one million Americans have lost their lives to the pandemic as of June 2023.[8] These deaths transcend any specific group of individuals; however, vulnerable populations have been the most affected by the disease. These vulnerable populations can include older adults and people of any age with serious underlying medical conditions like chronic organ disease as well as patients in group homes, homeless shelters, and prisons and long-term facilities like the psychiatric state hospital.[9] Due to the interconnectedness of these facilities, there is an increased likelihood of COVID-19 transmission in these centers.[10] The outbreaks can spread quickly in a psychiatric residential facility and recent reports indicate that the mortality rate has been high in these facilities. People with preexisting mental health disorders have an increased risk for COVID-19 infection which can result in worsened outcomes, including death.[11-13] As stated, mental health disorders have been associated with excess mortality from medical conditions such as cardiovascular and respiratory diseases. Other factors such as alcohol consumption, smoking, and low socioeconomic status can also worsen the prognosis of infection. Other reasons for the increased risk are challenges with processing health information, treatment compliance, limited access to health care, homelessness and living in settings with high risk of contagion transmission.[6,14,15] The World Health Organization reports that providing personalized medicine and support during COVID-19 is much more challenging in mental health institutions than in community settings, thereby increasing health inequalities in people with psychiatric illnesses.[16]

Though many studies have outlined predictors of mortality among hospitalized patients with COVID-19, not many studies have specifically observed the patient population with psychiatric illness in state hospitals. Thus, it is important to examine the mortality and comorbidity rate of patients and how various factors may contribute to the risk of COVID-19 outcomes for psychiatric patients admitted to a community hospital from state hospitals. The purpose of the current study is to examine the characteristics and outcomes of a series of patients admitted from a state psychiatric hospital to a community hospital for the treatment of COVID-19 infection. This study is observational in nature and aims to highlight patterns in this patient population and advance the literature by generating hypotheses for future investigation.

METHODS

This was a single center, retrospective study, that involved psychiatric patients from a state psychiatric hospital who were transferred to the Reading Hospital for medical treatment and who were confirmed to be infected with Covid-19 through SARS-CoV2-2 reverse transcriptase-polymerase chain reaction

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testing or antibody test result upon admission. The patient population included in the analysis met the following criteria: 1) 18 years old or above, 2) confirmed to be positive for COVID-19, and 3) experienced symptoms severe enough to be admitted to Reading Hospital between April 1, 2020, to June 30, 2022. Patients with multiple Covid-19 admissions to the hospital during this period were excluded if the period between admissions were less than two weeks.

Data from patients who met the inclusion criteria were extracted from the Electronic Medical Record (EMR) system. The data collected from charts included general demographic characteristics, psychiatric diagnosis, duration of psychiatric diagnosis, history of psychiatric treatment, date of admission, discharge disposition, and the history of medical comorbidities. General demographic characteristics included age, gender, race, ethnicity, smoking history, and substance abuse history. Medical comorbidities that were recorded included cancers, hypertension, myocardial infarction, heart failure, diabetes mellitus, obesity, chronic kidney diseases, and chronic obstructive pulmonary diseases. Variables in the data collection form were stored on a secure password-protected server.

The protocols for this study were approved by the institutional review board committee of the Reading Hospital.

STATISTICAL ANALYSIS

Patient age, number of comorbidities, and duration of management were calculated for their mean, median, standard deviation, and interquartile ranges. The patients prescribed psychotropic medications were subdivided into categories (*Table 1*). The general demographic characteristics, psychiatric diagnosis, comorbidities, prescribed medications, and mortality of the patient population were analyzed using proportions. All statistical analyses will be performed using IBM Statistical Package for the Social Sciences, SPSS Statistics version 28.[17]

RESULTS

Only 24 patients from the psychiatric state hospital who tested positive for COVID-19 were admitted at the Reading Hospital from April 1, 2020, to June 30, 2022. Of the 24 patient admissions, the average patient age was 57.75, and the gender distribution was divided into males (54.2%) and females (45.8%). Two (8.3%) patients died before discharge. Most patients had a history of smoking (62.5%), while most reported no history of substance abuse

TABLE 2. Sociodemographic Data of Psychiatric Patients Admitted for COVID-19

Characteristic	Patients, No. (%)
Age, mean (IQR)	57.75, (48-66)
Gender	
Male	13 (54.2%)
Female	11 (45.8%)
Race	
White	18 (75%)
African-American	3 (12.5%)
Other	3 (12.5%)
Ethnicity	
Hispanic/Latino	2 (8.3%)
Non-Hispanic/Latino	22 (91.7%)
Smoking	
Current	2 (8.3%)
Past	15 (62.5%)
Never	6 (25%)
Unknown	1 (4.2%)
Substance Abuse	
Current	0 (0%)
Past	2 (8.3%)
Never	22 (91.7%)
Unknown	0 (0%)
Mortality upon discharge	2 (8.3%)
Comorbidities, mean (IQR)	2.12 (2-3)
Duration of Psychiatric Illness Management, mean years (IQR)	4.25 (2-6)

(91.7%). Patients were found to have an average of 2.12 comorbidities, where 92% of patients had at least one comorbidity (*Table 2*). The most common comorbidities present at the time of their admissions were hypertension (54.2%), chronic kidney disease (41.2%), diabetes (33.3%), and obesity (33.3%) (*Figure 2*). The most common psychiatric disorders were schizoaffective disorder (70.8%), schizophrenia (29.2%), and delirium (29.2%) (*Figure 1*). Most patients were previously diagnosed with two psychiatric disorders (58.2%), while many of the remaining patients were diagnosed with only one psychiatric disorder (37.5%). Schizophrenia and schizoaffective disorders are conditions associated with severe psychiatric symptoms. The most common classes of psychotropic medications patients were taking

TABLE 3. Summary of Previous Research Studies that have found associations between Psychiatric Disorders and Common Medical Comorbidities found in the Study Population

	Hypertension	CKD	Diabetes	Obesity	COPD	Heart Failure	Cancer
Schizoaffective			+				
Schizophrenia		+	+	+	+		
Delirium		+					
Bipolar disorder	+		+	+	+		
Borderline personality	+			+			
Stress and Trauma related disorders	+	+	+	+		+	
Anxiety Disorders	+		+	+		+	+
Depressive Disorders		+	+	+	+	+	+

at the time of their admission were antipsychotics (83.3%), mood stabilizers (54.2%), antidepressants (54.2%) and benzodiazepines (41.7%) (*Figure 3*). In about half of admissions, patients were on four or more psychotropic medications (49.5%) while the other half were on three or fewer medications (50.5%), with all patients having been prescribed at least one medication. The most common disorder patients presented with was schizoaffective disorder, with 17 out of 24 admissions (70.83%) carrying this diagnosis. None of the patients in this study sample were diagnosed with ADHD, adjustment disorder, autism spectrum disorder, disruptive behavior disorder, OCD or a related disorder, personality disorder, or substance related disorder. Disorders that were classified as "other" included intellectual disability and eating disorders.

DISCUSSION

The 24 patients who met study criteria were admitted from a state hospital with about 260 beds, where all patients were involuntarily committed for psychiatric illness. The literature supports that COVID-19 is more transmissible in state hospital settings for patients who have chronic psychiatric disorders. This increase is not only due to patients being less compliant with safety guidelines from isolation to social distancing to masking, but also from facility characteristics including close contact between patients and staff members, common and shared areas, as well as the use of hand sanitizers that do not contain alcohol. Similarly, psychiatric patients with cognitive decline have been shown to not take as many precautions and paired with reduced exercise, these patients have lower immunity.[18]

The most common psychiatric disorders in this study population were schizoaffective disorder (70.8%), schizophrenia (29.2%), and delirium (29.2%). The high prevalence of delirium in this sample is likely associated with COVID-19 infection, whereas the diagnoses of schizoaffective disorder and schizophrenia are likely existing diagnoses prior to medical admission. The most common medical comorbidities patients had at the time of their admissions were hypertension (54.2%), chronic kidney disease (41.2%), diabetes mellitus (33.3%), as well as obesity (33.3%) (*Table 3*). Mario Gennaro Mazza, M.D., in a systematic review and meta-analysis that his group found that psychotic disorders, mood disorders, substance use disorders and intellectual disability disorders have an increased risk of mortality from COVID-19 infection, but not anxiety disorders.[19] They also found that use of antipsychotics and anxiolytics for psychotic disorders, and mood disorders also increased mortality from COVID-19 infection. Among the psychotic disorders, schizophrenia is associated with the greatest risk for mortality.[20] Of the two mortalities identified in our study, one did have schizophrenia and she was on clozapine, which is an atypical antipsychotic medication. The other mortality identified in our study was on valproic acid medication.

Studies have shown that patients with medical co-

FIGURE 1. Psychiatric Diagnoses present in the Study Population

Psychiatric Diagnoses
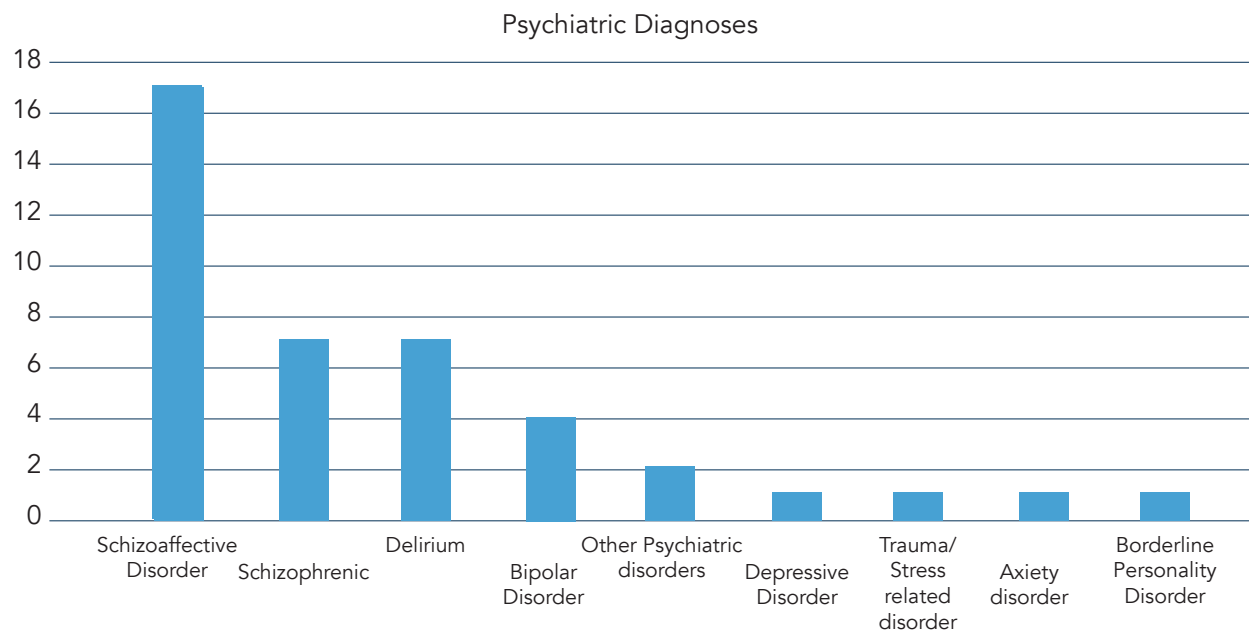
morbidities are at higher risk of both COVID-19 infection and increased severity of illness due to COVID-19. One article specifically identifies obesity, diabetes, COPD, hypertension, and malignancy comorbidities as particularly dangerous.[11] Our study corroborates these findings. These comorbidities are suggested to weaken organ systems and often the immune system, even before the person contracts COVID-19, as well as reduce those organs' abilities to defend the patient from COVID-19 once they have been infected.[6,21,22] Barriers and discrimination cause psychiatric patients to have limited access to timely treatment within healthcare settings.[23]

Other studies suggest that psychiatric medications may predispose patients to some of the medical comorbidities observed in this sample. Almost all antidepressants are known to cause weight gain. with the major exception of bupropion, which was not taken by any of the patients in this study.[24] Despite this association, use of antidepressants has not been reported to affect risk of contracting COVID-19.[7] Antipsychotic medications have been identified to have a significant association with obesity, a moderate association with diabetes, and little to no association with hypertension.[25] Antipsychotic-induced risk of diabetes has been shown to increase due to the medications' side effect of weight gain, as antipsychotics can directly and adversely affect the patient's insulin sensitivity and secretion.[25] However, some of the new atypical antipsychotics do not have this propensity. Furthermore, since antipsychotics are linked with increased smoking, it follows that people being treated for bipolar disorder and schizophrenia tend to have higher incidences of COPD.[26] Despite these side effects, a recent study demonstrated that paliperidone, a second-generation antipsychotic, was associated with a decreased risk of COVID-19 infection (compared to first-generation antipsychotics, which did not show such an association).[7] In addition, for mood stabilizers, their effect on both weight and diabetes depends on the type of mood stabilizer being prescribed.[27] For instance, topiramate can be used as a mood stabilizer but it has also been used as an off-label medication for obese patients due to one of its side effects of weight loss.[28] On the other hand, the mood stabilizer lithium has been shown to cause significant weight gain and can even lead to nephrogenic diabetes insipidus.[29] However, a recent investigation reports that patients with therapeutic lithium levels have a lower incidence of COVID-19 infection compared with patients with subtherapeutic lithium levels.[30] Valproate also causes significant weight gain and has been shown to negatively affect the outcome of COVID-19.[7] Thus, the literature is mixed regarding effects of different psychiatric medications on risks associated with COVID-19 infection, and further investigation is warranted.

It is well-established that the social determinants of health may add to COVID-19 risks that patients admitted to a state hospital may face; individuals in marginalized groups may be more vulnerable to diseases and infections such as COVID-19. The social determinants of health may be associated with many

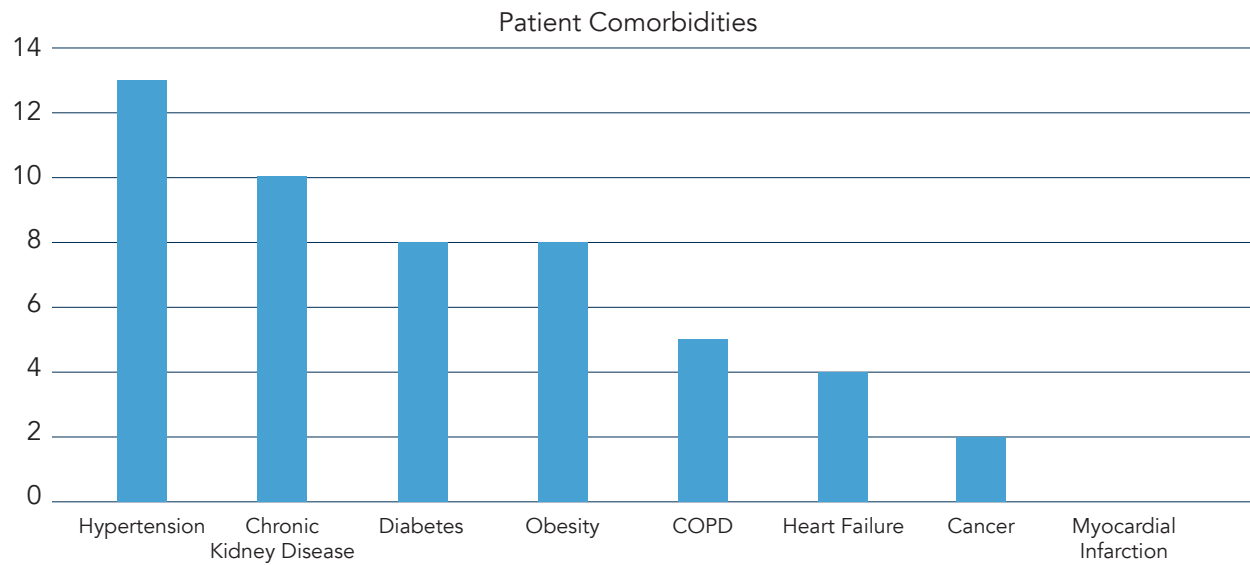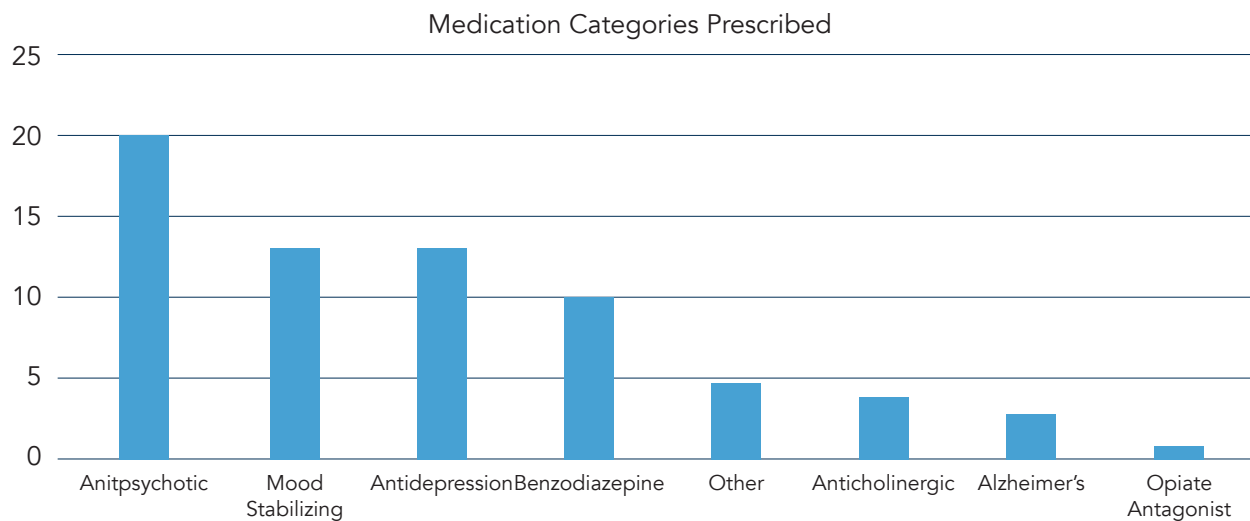**FIGURE 2.** Patient Comorbidities present in the Study Population

Patient Comorbidities

[Bar chart showing Patient Comorbidities. Y-axis from 0 to 14. Hypertension: 13, Chronic Kidney Disease: 10, Diabetes: 8, Obesity: 8, COPD: 5, Heart Failure: 4, Cancer: 2, Myocardial Infarction: 0]

FIGURE 3. Medication Categories Prescribed to patients in the Study Population

Medication Categories Prescribed

[Bar chart showing Medication Categories Prescribed. Y-axis from 0 to 25. Anitpsychotic: 20, Mood Stabilizing: 13, Antidepression: 13, Benzodiazepine: 10, Other: ~4.7, Anticholinergic: ~3.8, Alzheimer's: ~2.7, Opiate Antagonist: ~0.7]

comorbidities, including obesity, hypertension, and chronic kidney disease, which in turn increases the severity of the patients COVID-19 infection.[31] Public policy and social rules implemented at the beginning of the pandemic may have contributed to patients worsened mental health problems which then sets patients up for a higher risk of increased COVID-19 infection and severity. For example, the Pennsylvania Department of Health and Human Services suspended visitation at state-run hospitals with exceptions only for medical or legal reasons during the outbreak of the pandemic in March 2020.[32,33] Policies such as this likely contributed to

social determinants such as loneliness which, during the COVID-19 pandemic, was worsened for patients with mental health issues including anxiety and depression.[34,35]

There are a few research limitations to consider in this study. Firstly, the limited patient sample size is a significant constraint. Due to policy changes and logistical challenges that arose during the pandemic at the state hospital, transferring psychiatric patients with COVID-19 to another facility for specialized care restricted the number of patients that can be included in this study. Consequently, the generalizability of this study's findings is limited, and it is chal-

lenging to make broad inferences about the entire population of psychiatric patients. Secondly, limited access to patient data posed another limitation. Due to the privacy concerns and the complexities of obtaining patient records from multiple institutions, there was difficulty in accessing comprehensive and detailed information for each patient, which limits the ability to identify significant patterns or associations.

It is crucial to acknowledge these limitations as they highlight the challenges and constraints in conducting studies on psychiatric patients with COVID-19. Because of these challenges and constraints, our study became qualitative in nature. However, our findings may still shed light on conditions that may precipitate the worsening of COVID-19 infection in hospitalized patients. Thus, these factors should be considered when interpreting these results and emphasize the need for further research to address these limitations and provide a more comprehensive understanding of the impact of COVID-19 on this vulnerable population. Promising areas of future investigation include exploration of possible relationships between specific psychiatric medications, medical comorbidities, and COVID-19 outcomes.

REFERENCES

1. National Institute of Mental Health. Mental illness. (2021). Accessed: April 28, 2024: https://www.nimh.nih.gov.

2. De Hert, M., Correll, C., Bobes, J., et al. (February 2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry. 2011 Feb., 10(1):52-77. https://doi.org/10.1002/j.2051-5545.2011.tb00014.x

3. Momen, N., Plana-Ripoll, O., Agerbo, E., et al. (March 30, 2022). Mortality Associated with Mental Disorders and Comorbid General Medical Conditions. JAMA Psychiatry. 2022; 79(5): 444-453. https://doi.org/10.1001/jamapsychiatry.2022.0347

4. Taquet, M., Luciano, S., Geddes, JR., et al. (February 2021). Bidirectional associations between COVID-19 and psychiatric disorders: retrospective cohort studies of 62,354 COVID-19 cases in the USA. Lancet Psychiatry. 2021 Feb; 8(2): 130-140. https://doi.org/10.1016/S2215-0366(20)30462-4

5. Lee, SW., Yang, JM., Moon, SY., et al. (December 2020). Association between mental illness and COVID-19 susceptibility and clinical outcomes in South Korea: a nationwide cohort study. Lancet Psychiatry. 2020 December;7(12):1025-1031. https://doi.org/10.1016/S2215-0366(20)30421-1

6. Wang, Q., Xu, R., Volkow ND., et al. (October 2021). Increased risk of COVID-19 infection and mortality in people with mental disorders: analysis from electronic health records in the United States. World Psychiatry. 2021 October; 20(1):124-130. https://doi.org/10.1002/wps.20806

7. Nemani, K., Williams, S., Olfson, M., et al. (May 2, 2022). Association Between the Use of Psychotropic Medications and the Risk of COVID-19 Infection Among Long-term Inpatients with Serious Mental Illness in a New York State-wide Psychiatric Hospital System. JAMA New Open. 2022 May 2;5(5): e2210743. https://doi.org/10.1001/jamanetworkopen.2022.10743

8. COVID-19 Date in Motion. (2023). Accessed on July 1, 2023, from https://coronavirus.jhu.edu/

9. Mosites, E., et al., Assessment of SARS-CoV-2 infection prevalence in homeless shelters—four US cities, March 27–April 15, 2020. Morbidity and mortality weekly report, 2020. 69(17): p. 521

10. Wallace, M., COVID-19 in correctional and detention facilities—United States, February–April 2020. Morbidity and mortality weekly report, 2020. 69.

11. Callaghan AW, Chard AN, Arnold P, et al. Screening for SARS-CoV-2 Infection Within a Psychiatric Hospital and Considerations for Limiting Transmission Within Residential Psychiatric Facilities - Wyoming, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(26):825-829. Published 2020 Jul 3. https://doi.org/10.15585/mmwr.mm6926a4

12. Parry SJ, Chamorro V, Mohan R. Responding to COVID-19 in Psychiatric Rehabilitation: Collaboration Is Vital. J Psychosoc Rehabil Ment Health. 2020;7(3):209-210. https://doi.org/10.1007/s40737-020-00180-x

13. Simpson AIF, Chatterjee S, Darby P, et al. Management of COVID-19 Response in a Secure Forensic Mental Health Setting: Réponse à la gestion de la COVID-19 dans un établissement sécurisé de santé mentale et de psychiatrie légale. Can J Psychiatry. 2020;65(10):695-700. https://doi.org/10.1177/0706743720935648

14. Barnett AH, Mackin P, Chaudhry I, et al. Minimizing metabolic and cardiovascular risk in schizophrenia: diabetes, obesity and dyslipidemia. J Psychopharmacology. 2007;21(4):357-373. https://doi.org/10.1177/0269881107075509

15. Basrak N, Mulcrone N, Sharifuddin S, et al. Risk of adverse outcome of COVID-19 among patients in secure psychiatric services: observational cohort study. BJPsych Open. 2021;7(1): e31. Published 2021 Jan 11. https://doi.org/10.1192/bjo.2020.169

16. Tian HY. Zhonghua Yu Fang Yi Xue Za Zhi. Chinese Medical Association Publishing, 2020;54(0): E001. doi: 10.3760/cma.j.issn.0253-9624.2020.0001

17. IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY:IBM Corp.

18. Li L. Challenges and Priorities in Responding to COVID-19 in Inpatient Psychiatry. Psychiatr Serv. 2020;71(6):624-626. https://doi.org/10.1176/appi.ps.202000166

19. Vai, B., Mazza, MG., Colli, CD., et al. (September 2021). Mental disorders and risk of COVID-19-related mortality, hospitalization, and intensive care unit admission: a systematic review and meta-analysis. Lancet Psychiatry. 2021Sept;8(9):797-812. https://doi.org/10.1016/S2215-0366(21)00232-7

20. Teixiera, AL., Krause TM., Ghosh, L., et al. (November 1, 2021). Analysis of COVID-19 Infection and Mortality Among Patients with Psychiatric Disorders, 2020. JAMA Netw Open.2021 Nov 1;4(11):e2134969. https://doi.org/10.1001/jamanetworkopen.2021.34969

21. Lee DY, Cho J, You SC, et al. Risk of Mortality in Elderly Coronavirus Disease 2019 Patients with Mental Health Disorders: A Nationwide Retrospective Study in South Korea. Am J Geriatric Psychiatry. 2020;28(12):1308-1316. doi: 10.1016/j.jagp.2020.09.016

22. Jeon HL, Kwon JS, Park SH, Shin JY. Association of mental disorders with SARS-CoV-2 infection and severe health outcomes: nationwide cohort study. Br J Psychiatry. 2021;218(6):344-351. https://doi.org/10.1016/j.jagp.2020.09.016

23. He Y, Yu R, Ren J. The Correlation between Psychiatric Disorders and COVID-19: A Narrative Review. Psychiatr Danub. 2021;33(1):76-85. https://doi.org/10.24869/psyd.2021.76

24. Stahl, S. M. Stahl's essential psychopharmacology: Prescriber's guide (6th ed.). Cambridge University Press; 2017.

25. Saddichha S, Vishnuvardhan G, Akhtar S. Obesity, diabetes and hypertension associated with antipsychotic use in remitted schizophrenia. Int J Risk Saf Med. 2011;23(3):181-185. https://doi.org/10.3233/JRS-2011-0536

26. Zareifopoulos N, Bellou A, Spiropoulou A, Spiropoulos K. Prevalence of Comorbid Chronic Obstructive Pulmonary Disease in Individuals Suffering from Schizophrenia and Bipolar Disorder: A Systematic Review. COPD. 2018;15(6):612-620. https://doi.org/10.1080/15412555.2019.1572730

27. Grootens KP, Meijer A, Hartong EG, et al. Weight changes associated with antiepileptic mood stabilizers in the treatment of bipolar disorder [published correction appears in Eur J Clin Pharmacol. 2018 Sep 14;]. Eur J Clin

Pharmacol. 2018;74(11):1485-1489. https://doi.org/10.1007/s00228-018-2517-2

28. Khera R, Murad MH, Chandar AK, et al. Association of Pharmacological Treatments for Obesity with Weight Loss and Adverse Events: A Systematic Review and Meta-analysis [published correction appears in JAMA. 2016 Sep 6;316(9):995]. JAMA. 2016;315(22):2424-2434. https://doi.org/10.1001/jama.2016.7602

29. Davis J, Desmond M, Berk M. Lithium and nephrotoxicity: a literature review of approaches to clinical management and risk stratification. BMC Nephrol. 2018;19(1):305. Published 2018 Nov 3. https://doi.org/10.1186/s12882-018-1101-4

30. De Picker L, Leboyer M, Geddes JR, Morrens M, Harrison PJ, Taquet M. Association Between Serum Lithium Level and Incidence of COVID-19 Infection. Br J Psychiatry. 2022 July 01; 221(1): 425-427. https://doi.org/10.1192/bjp.2022.42

31. Singu S, Acharya A, Challagundla K, Byrareddy SN. Impact of Social Determinants of Health on the Emerging COVID-19 Pandemic in the United States. Front Public Health. 2020; 8:406. Published 2020 Jul 21. https://doi.org/10.3389/fpubh.2020.00406

32. Centers for United States Medicare & Medicaid Services. Nursing Home Visitation - COVID-19. Dept. of Health and Human Services, Centers for Medicare & Medicaid Services. Updated March 2022. Accessed August 2022. https://www.cms.gov/files/document/qso-20-39-nh-revised.pdf

33. CBS Pittsburgh. Coronavirus Changes: Pa. Human Services Dept. Implementing New Restrictions. March 19, 2022. Accessed August 2022. https://www.cbsnews.com/pittsburgh/news/coronavirus-changes-pennsylvania-department-of-human-services/

34. McQuaid RJ, Cox SML, Ogunlana A, Jaworska N. The burden of loneliness: Implications of the social determinants of health during COVID-19. Psychiatry Res. 2021; 296:113648. https://doi.org/10.1016/j.psychres.2020.113648

35. Bernardini F, Attademo L, Rotter M, Compton MT. Social Determinants of Mental Health as Mediators and Moderators of the Mental Health Impacts of the COVID-19 Pandemic. Psychiatr Serv. 2021;72(5):598-601. https://doi.org/10.1176/appi.ps.202000393