Brief Communication

CLINICAL AND EXPERIMENTAL VACCINE RESEARCH

Varicella zoster virus infection and reactivation in a psychiatric ward during the COVID-19 pandemic: a case series analysis

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Severe mental illness (SMI) may increase susceptibility to varicella zoster virus (VZV), but VZV epidemiology in psychiatric wards is poorly described. We reviewed 54 women with SMI in a closed 50-bed psychiatric ward (July 2021–December 2024) and identified 3 varicella and 2 herpes zoster cases during April–October 2023. The varicella attack rate among exposed susceptibles was 6.38%, and herpes zoster incidence was 12.41 per 1,000 person-years. All case patients had received coronavirus disease 2019 vaccination and had prior severe acute respiratory syndrome coronavirus 2 infection. These findings highlight infection-control challenges, immune vulnerabilities, and prevention gaps in long-term psychiatric settings.

Keywords: Mental illness; Varicella zoster virus; Herpes zoster; Varicella; Psychiatric hospital

Varicella zoster virus (VZV) causes varicella (chickenpox) after initial infection and can later reactivate as herpes zoster (shingles). These 2 phases have distinct risk profiles and prevention strategies. Reactivation risk rises with impaired cell-mediated immunity, such as in hematologic malignancy, advanced human immunodeficiency virus, or immunosuppressive drug use [1]. People with severe mental illness (SMI) may be especially vulnerable due to immune dysregulation, comorbidities, nutritional deficiencies, chronic psychotropic use, group living, and barriers to care [2-8]. VZV epidemiology in psychiatric facilities is poorly characterized; most data are from community cohorts [9]. During coronavirus disease 2019 (COVID-19), psychiatric wards adopted universal vaccination and enhanced disease surveillance. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection is linked to a short-term rise in zoster risk [10-13], while population-level vaccine effects remain inconsistent [14-16]. From July 2021 to December 2024, a 50-bed, female-only psychiatric ward reported its first VZV cases in over 20 years: 3 varicella and 2 zoster events between April and October 2023. This communication summarizes these cases, clinical features, and infection-control implications in the context of universal COVID-19 exposure.

This observational study used de-identified data from a 50-bed female psychiatric ward at Tsaotun Psychiatric Center (TTPC). Fifty-four patients were admitted between July 2021 and December 2024. The protocol was approved by the Institutional Review Board, TTPC (No. 113022); informed consent was waived for de-identified data. The ward maintained surveillance for SARS-CoV-2 infection,

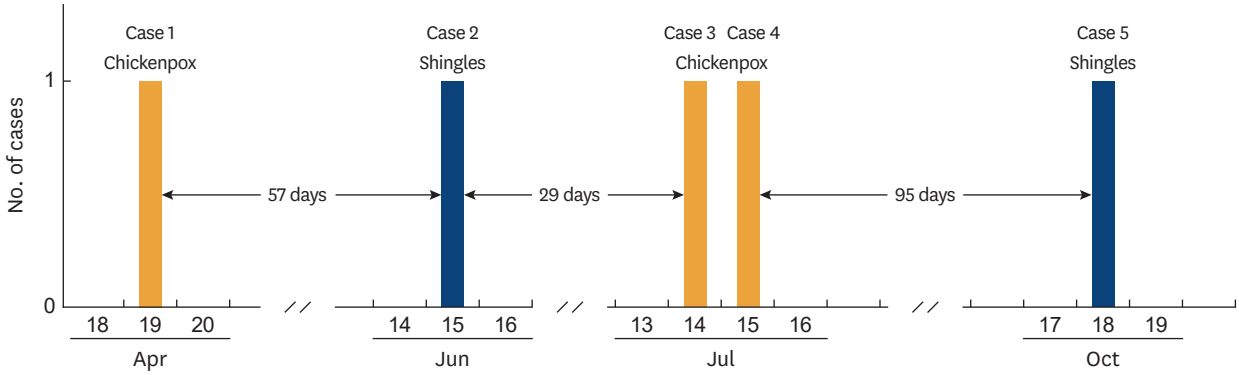

Fig. 1. Number of varicella-zoster virus infection (varicella, chickenpox) or reactivation (herpes zoster, shingles) by confirm date over time for severe mental illness residents in a long-term care psychiatric ward.

COVID-19 vaccination, and other reportable diseases. Between April and October 2023, 5 individuals experienced VZV events: 3 varicella and 2 zoster (**Fig. 1**, **Table 1**). These patients were compared to those without VZV events for demographics, diagnoses, comorbidities, and COVID-19 exposures (**Table 2**). Childhood varicella history, vaccination status, and baseline VZV immunoglobulin G (IgG) were not routinely documented; prior exposure and susceptibility status were unverified.

Case ascertainment involved daily skin assessments, with dermatology referral for any rash. During the outbreak, surveillance increased to 3-times-daily skin checks, and suspected cases were isolated. Diagnoses were clinical; polymerase chain reaction (PCR) and viral culture were unavailable. Varicella was defined as an acute generalized pruritic vesicular rash with maculopapular progression, lesions at different stages, and a centripetal distribution, usually with fever or malaise. Zoster was defined as a unilateral dermatomal eruption with localized pain or paresthesia. SARS-CoV-2 infection was confirmed by rapid antigen testing; PCR was used if antigen testing was negative. COVID-19 vaccination data were collected from the ward's immunization program. Seasonal influenza and pneumococcal vaccines were administered according to national recommendations; 6 individuals who declined influenza vaccination were also unvaccinated against COVID-19, and all remained VZV-negative, while 6 patients aged >70 years received pneumococcal vaccine, including one VZV-positive case (case 5). One VZV-negative patient received chronic low-dose systemic corticosteroids (prednisolone 5 mg daily for more than 3 years) for systemic lupus erythematosus.

After the first varicella case (April 2023), protocols included immediate isolation, contact tracing, assessment for post-exposure prophylaxis, and enhanced surveillance for 21–28 days. As VZV IgG and varicella vaccination histories were unavailable, all residents without prior documented VZV events were assumed susceptible for attack rate calculations, acknowledging that immunity was likely heterogeneous. For zoster, incidence per 1,000 person-years was calculated and risk factors compared qualitatively.

Over 3.5 years, 54 women with SMI were admitted (mean age, 56.94 years), with diagnoses of schizophrenia (90.7%), bipolar disorder (7.4%), or major neurocognitive disorder (1.9%) (**Table 2**). Metabolic and cardiovascular comorbidities were frequent: metabolic syndrome (64.8%), hyperlipidemia (57.4%), diabetes (20.4%), hypertension (18.5%), iron deficiency anemia (14.8%), and renal or liver disease (9.3%). Forty-eight (88.9%) patients received at least one COVID-19 vaccine dose (mean, 4.26), and all had at least one SARS-CoV-2 infection; 24.1% had a single infection and 75.9% had reinfections. The ward had outbreaks in June 2022, September 2022, and July 2023, resulting in universal exposure to both vaccination and infection before VZV events.

Five patients (9.3%) developed VZV events between April and October 2023: 3 varicella (April 19, July 14, July 15) and 2 zoster (June 15, October 18) (**Fig. 1**, **Table 1**). These were the first documented VZV cases in the ward's 20-year history. Cases spanned ages 31–71; 4 had schizophrenia and 3 had iron deficiency anemia. Cases 1, 3, and 4 had generalized vesicular eruptions, fever, and pruritus, supporting primary varicella rather than atypical zoster. Both zoster cases had unilateral dermatomal clusters with neuropathic pain and no mucosal involvement, consistent with localized herpes zoster.

The outbreak began with an index varicella case in April 2023 (52-year-old with schizophrenia), isolated for 21 days. Fifty-seven days later, a 68-year-old developed localized zoster (single thoracic dermatome, no mucosal or visceral involvement). Twenty-nine days after this, 2 roommates developed varicella on consecutive days; both were isolated for 1 month. The 29-day interval exceeds the usual

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Table 1. Clinical summary of 5 patients with VZV infection/reactivation

Patient	Case 1	Case 2	Case 3	Case 4	Case 5
Age (yr)	52	68	51	31	71
Sex	Female	Female	Female	Female	Female
Psychiatric disease	Schizophrenia	Schizophrenia	Schizophrenia	Intellectual disability Bipolar I disorder	Schizophrenia
Medications	Aripiprazole Fe	Clozapine Fe	Olanzapine Valproate Fe	Olanzapine Valproate	Risperidone
Comorbid/ Physical disease	Iron deficit anemia Atopic dermatitis	DM Hyperlipidemia Iron deficit anemia	Iron deficit anemia	Metabolic syndromes	Congestive heart disease
COVID-19 vaccine	2021/07/15-mRNA-1273	2021/07/16-mRNA-1273	2021/12/30-mRNA-1273	2021/07/15-mRNA-1273	2021/07/15-mRNA-1273
SARS-CoV-2 infection	2021/11/08-mRNA-1273	2021/10/26-mRNA-1273	2022/02/10-mRNA-1273	2021/11/08-mRNA-1273	2021/11/08-mRNA-1273
VZV infection/ reactivation	2022/02/22-mRNA-1273 2022/06/21-SARS-CoV-2 2023/04/19-Chickenpox	2022/02/22-mRNA-1273 2022/06/24-SARS-CoV-2 2022/09/28-SARS-CoV-2 2022/12/29-mRNA-1273.214 2023/05/03-mRNA-1273.222 2023/06/15-Shingles	2022/05/26-mRNA-1273 2022/06/25-SARS-CoV-2 2022/10/17-mRNA-1273.214 2023/05/03-mRNA-1273.222 2023/07/14-Chickenpox	2022/02/22-mRNA-1273 2022/06/24-SARS-CoV-2 2022/10/24-NVX-CoV2601 2023/05/03-mRNA-1273.222 2023/07/15-Chickenpox	2022/02/22-mRNA-1273 2022/06/23-SARS-CoV-2 2022/10/24-NVX-CoV2601 2023/05/03-mRNA-1273.222 2023/10/18-Shingles
Days of VZV onset after last COVID-19 vaccine	421	43	72	73	168
Days of VZV onset after last SARS-CoV-2 infection	302	260	384	386	482
Hematology	2023/03/01	2023/05/09	2023/04/06	2023/04/06	2023/09/11
WBC (10^3/μL)	5.2	7.9	3.5	8.9	5.08
RBC (10^6/μL)	4.7	4.3	4.57	4.28	3.65
Hb (g/dL)	12.9	14.1	14	12.5	11.2
Hct (%)	39	41.9	41.3	37.2	34.4
MCV (fL)	82.9	97.3	90.3	87	94.2
MCH (pg)	27.4	32.9	30.7	29.1	30.7
MCHC (g/dL)	33	33.8	34	33.5	32.6
Platelet (×10^3/μL)	215	256	160	224	227
PDW (fL)	16.1	16	16.3	16.9	13
N-Seg (%)	62.8	66	45.2	64.6	69.5
Eosin (%)	3.4	0.9	1.8	0	0.2
Baso (%)	0.6	0.2	0.4	0.2	0.2
MONO (%)	3.4	8.5	5.4	5.5	6.1
Lymph (%)	29.8	24.4	47.2	27.7	24

Reference range presented as follows: WBC, 3.5–9.6 (10^3/μL); RBC, 3.68–5.46 (10^6/μL); Hb, 10.9–15.6 (g/dL); Hct, 33–47 (%); MCV, 76.9–94.7 (fL); MCH, 25.3–33.3 (pg); MCHC, 31.9–35.4 (g/dL); Platelet, 169–413 (×10^3/μL); N-Seg, 41.7–73.7 (%); Eosin, 0–7 (%); Baso, 0–2 (%); MONO, 4.6–12.3 (%); Lymph, 18.4–45.0 (%).
VZV, varicella zoster virus; DM, diabetes mellitus; COVID-19, coronavirus disease 2019; mRNA, messenger RNA; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; WBC, white blood cell; RBC, red blood cell; Hb, hemoglobin; Hct, hematocrit; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; PDW, platelet distribution width; N-Seg, neutrophils; Eosin, eosinophils; Baso, basophils; MONO, monocytes; Lymph, lymphocytes.

incubation but falls within the extended window reported in high-risk hosts [17], making transmission plausible. A final localized zoster case (age 71) occurred in October 2023, 95 days after the previous cases.

At onset, 49 residents without VZV events were exposed; no secondary cases occurred, for an attack rate of 0% after the index varicella case. Following the zoster case, 48 susceptibles remained; 2 secondary varicella cases occurred,

Table 2. The demographic and clinical characteristics of 54 patients who hospitalized in the ward stratified by with or without VZV infection/reactivation or not

Characteristics	Total (n=54)	VZV	
		Positive[a] (n=5)	Negative (n=49)
Age (yr)	56.94±10.82	54.80±15.98	57.15±10.37
Body weight (kg)	51.78±9.97	49.22±17.28	52.04±9.17
Height (m)	1.54±0.06	1.52±0.04	1.55±0.06
BMI (kg/m^2)	21.65±3.80	21.24±6.80	21.69±3.47
COVID-19 vaccination			
Total COVID-19 vaccine doses before VZV onset or end of follow-up No. (0/3/4/5 doses)	6/40/6/2	0/4/0/1	6/36/6/1
Total COVID-19 vaccine doses	4.26±1.59	4.60±0.89	4.22±1.65
Vaccinated with ≥1 dose	48/54 (88.9)	5/5 (100.0)	43/49 (87.8)
SARS-CoV-2 infection history			
Number of SARS-CoV-2 infections, No. (once/twice/three times)	13/30/11	4/1/0	9/29/11
Frequencies of SARS-CoV-2 infection	1.96±0.67	1.20±0.45	2.04±0.64
Single infection	13/54 (24.1)	4/5 (80.0)	9/49 (18.4)
≥2 infection (reinfection)	41/54 (75.9)	1/5 (20.0)	40/49 (81.6)
Psychiatric diagnosis[b]			
Schizophrenia	49/54 (90.7)	4/5 (80.0)	45/49 (91.8)
Bipolar disorder	4/54 (7.4)	1/5 (20.0)	3/49 (6.1)
Organic	1/54 (1.9)	0/5 (0.0)	1/49 (2.0)
Coexisting physical conditions and corticosteroid exposure			
Diabetes mellitus	11/54 (20.4)	1/5 (20.0)	10/49 (20.4)
Hyperlipidemia	31/54 (57.4)	2/5 (40.0)	29/49 (59.2)
Hypertension	1/54 (18.5)	0/5 (0.0)	10/49 (20.4)
Metabolic symptoms	35/54 (64.8)	2/5 (40.0)	33/49 (67.3)
Renal diseases	5/54 (9.3)	0/5 (0.0)	5/49 (10.2)
Liver diseases	5/54 (9.3)	1/5 (20.0)	4/49 (8.2)
Iron deficiency anemia	8/54 (14.8)	3/5 (60.0)	5/49 (10.2)
Systemic corticosteroid treatment[c]	1/54 (1.9)	0/5 (0.0)	1/49 (2.0)

Values are presented as mean ± standard deviation or number/total number (%).
VZV, varicella zoster virus; BMI, body mass index; COVID-19, coronavirus disease 2019; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.
[a]Three patients with primary VZV infection (varicella), 2 patients with VZV reactivation (herpes zoster).
[b]Psychiatric diagnosis is defined according to DSM-5 criteria as including schizophrenia, bipolar I disorder (bipolar disorder), and major neurocognitive disorder with behavioral disturbance (organic).
[c]One VZV-negative patient received chronic low-dose systemic corticosteroid therapy (prednisolone 5 mg per day for more than 3 years) for a non-psychiatric indication (systemic lupus erythematosus); no VZV-positive patient received systemic corticosteroids during the observation period.

yielding a 4.17% secondary attack rate. Overall, 3 varicella cases occurred among 47 susceptibles (6.38% attack rate). Across 161.31 person-years of follow-up, 2 zoster cases corresponded to an incidence of approximately 12.41 per 1,000 person-years, similar to rates reported in older adults [18]. VZV events occurred 43–421 days after last COVID-19 vaccination and 260–482 days after last SARS-CoV-2 infection.

Comparative analysis showed similar age and body mass index between VZV-positive and VZV-negative groups, with schizophrenia predominating in both (**Table 2**). All VZV-positive patients were vaccinated against COVID-19 (mean, 4.60 doses) versus 88% of VZV-negative patients (mean, 4.22). VZV-positive patients had fewer SARS-CoV-2 infections (mean, 1.20) than VZV-negative patients (mean, 2.04), and 20% of VZV-positive patients had reinfection versus 81.6% of VZV-negative patients. Metabolic syndrome, diabetes, and hyperlipidemia were common in both groups. Iron deficiency anemia was more frequent in VZV-positive patients (60%) than VZV-negative patients (10.2%). Systemic corticosteroids were used in 1 VZV-negative patient.

This case series suggests several prevention lessons for psychiatric facilities. The absence of secondary cases after isolation of the index varicella patient indicates that airborne and contact precautions can interrupt transmission in crowded wards. In contrast, 2 secondary varicella cases followed a localized zoster case, showing that zoster patients with exposed lesions can be a VZV source in psychiatric settings. This reinforces guidance that patients with varicella or disseminated zoster should receive airborne and contact precautions and that localized zoster lesions must be fully

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covered; if this is not feasible, airborne and contact precautions may also be warranted. The 29-day interval between the zoster case and subsequent varicella cases, within the extended incubation window for high-risk hosts, suggests maintaining surveillance for 28 days after exposure in similar wards [17].

Several observations argue against a major long-term effect of COVID-19 exposures on VZV events in this cohort. Our VZV-positive patients had fewer SARS-CoV-2 reinfections than VZV-negative patients, suggesting cumulative COVID-19 burden did not correlate with VZV risk. VZV events occurred months after the most recent COVID-19 infection or vaccination, outside the typical post-COVID zoster risk window [14,19]. Both zoster and most varicella patients had established VZV risk factors independent of COVID-19, including advanced age, chronic SMI, long-term psychotropic treatment, metabolic or cardiovascular disease, and iron deficiency [20]. These vulnerabilities, together with intensified surveillance, likely explain the observed VZV incidence more than direct immunologic effects of COVID-19. At the same time, the VZV event incidence (9.3%) in this small psychiatric cohort, compared to very low zoster rates after COVID-19 vaccination in larger populations [15,16], underscores the need for targeted VZV prevention in SMI settings.

The high prevalence of iron deficiency anemia among VZV-positive patients suggests a modifiable risk factor. Iron deficiency is associated with impaired cell-mediated immunity, including reduced T-lymphocyte proliferation and diminished natural killer cell activity, which are central for controlling latent herpesviruses [8]. VZV-positive patients also had multiple metabolic and cardiovascular comorbidities, supporting the role of these conditions as zoster risk factors seen in larger studies. Although the sample is small, our findings support mechanisms of SMI-related immune vulnerability.

This study is limited by small sample size and few VZV events, which preclude risk modeling. The single, female-only ward constrains generalizability, as sex-specific factors may influence VZV epidemiology. All diagnoses were clinical, without PCR or culture confirmation, so misclassification cannot be excluded, though dermatologic assessment and typical patterns mitigate this risk. Baseline VZV immunity and varicella vaccination histories were unavailable, so true susceptibility is unknown and likely heterogeneous; calculated attack rates should be interpreted conservatively. Not all vaccine histories were systematically captured. Notably, non-receipt of influenza and COVID-19 vaccination and chronic low-dose prednisolone for systemic lupus erythematosus were observed only in VZV-negative patients, suggesting these exposures were present but not clearly more common in VZV-positive cases. Within these constraints, this report documents a mixed pattern of person-to-person spread and independent reactivation in a vulnerable psychiatric population, highlighting prevention gaps such as underuse of zoster vaccination and under-recognition of iron deficiency and other modifiable immune risk factors.

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Conflict of Interest
No potential conflict of interest relevant to this article was reported.

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