


# Vaccination rates against COVID-19 in patients with severe mental illness attending community mental health services in rural Greece

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## Abstract

**Background:** Patients with severe mental illness (SMI) may be at increased risk for COVID-19-related severe morbidity and mortality. There is limited research on the vaccination rates against COVID-19 in patients with SMI.

**Aims:** The objective of the present study is to explore vaccination rates and co-relations in patients with SMI, attending community mental health services, namely the Mobile Mental Health Units (MMHUs) in rural Greece.

**Method:** All treatment engaged patients with SMI (schizophrenia-spectrum or bipolar disorder) with two MMHUs (MMHU of Kefalonia, Zakynthos and Ithaca, [MMHU KZI] and MMHU of the prefectures of Ioannina and Thesprotia [MMHU I-T]) in rural Greece were enrolled prospectively over a six-month period. The MMHU I-T had adopted a more proactive approach to patients' vaccination, by informing patients and caregivers for its benefits.

**Results:** Data were analyzed for 197 patients with SMI. The overall vaccination rate was 68.5% and did not differ from the respective rates in the general population. There were no differences in vaccination rates among patients attending the two MMHUs, nor among patients with different diagnoses (schizophrenia spectrum disorders or bipolar disorder). Vaccination was not associated with gender, educational level, history of alcohol and substance abuse, illness duration, or number of previous hospitalizations, whereas the effect size of age was moderate. In more than half non-vaccinated patients the refusal to get vaccinated was associated with fears and concerns as well as false beliefs that are encountered in the general population.

**Conclusion:** In the present sample of treatment-engaged rural patients vaccination rates against COVID-19 appear to be satisfactory. There were no differences in vaccination rates with regard to the interventions that were applied to enhance vaccination. It seems that other forms of intervention should be applied to reluctant patients to modify their attitudes toward vaccination.

## Keywords

Bipolar disorder, COVID-19, rural areas, schizophrenia, severe mental illness, vaccination

## Introduction

The COVID-19 outbreak remains a major health challenge across the globe. The pandemic would be expected to affect mostly the individuals with social and economic adversities, low health literacy and restricted access to healthcare, such as the patients with mental illness (Hamada & Fan, 2020; Kozloff et al., 2020). Indeed, several reports suggest that individuals with mental disorders, particularly those with severe mental illness (SMI), are at increased risk for COVID-19-related severe morbidity and mortality (Hassan et al., 2021; Nemani et al., 2021; Teixeira et al., 2021; Wang, Xu et al., 2021). Recent systematic reviews and meta-analyses found that patients with schizophrenia have a high risk of being infected by

the new coronavirus and display significantly higher mortality rate than the general population (Karaoulanis & Christodoulou, 2021; Toubasi et al., 2021). Accordingly, it has been argued that there is a necessity for those

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patients to have better access to healthcare (Karaoulanis & Christodoulou, 2021; Seon et al., 2021). Moreover, there were calls by experts to prioritize those patients in COVID-19 vaccination programs to minimize the effects of the pandemic on this vulnerable population of patients (De Hert et al., 2021; Suhas, 2021). Despite these notions, it is alarming that a recent study in Israel found that individuals with schizophrenia are being under-vaccinated for COVID-19 compared to the rest of the population (Tzur Bitan, Kridin et al., 2021). These findings may be even more relevant in patients with SMI living in rural and remote areas, who may receive mental health treatment less frequently and often with providers with less specialized training, compared to those residing in metropolitan locations (Morales et al., 2020). Indeed, there is little research on psychotic disorders in rural areas worldwide, and findings so far indicate the impact of socioeconomic inequalities on outcome and treatment, and stress the importance of minimizing mental health disparities (Peritogiannis & Samakouri, 2021).

Currently there are no data available regarding COVID-19 vaccination in patients with SMI in rural Greece. Those patients may receive care by community mental health services namely the Mobile Mental Health Units (MMHUs). The objective of the present study was therefore to record the rates of vaccination in patients with SMI attending MMHUs in rural areas in Greece; and to assess the effects of the interventions of MMHUs with regards to the vaccination rates in those patients.

## Methods

### *MMHUs in rural Greece*

To address the mental healthcare needs of rural and remote areas the Greek state has launched a number of MMHUs over the last decades in the mainland and in several of the numerous Greek islands (Peritogiannis et al., 2011, 2017; Stylianidis et al., 2016). Those community-based services are interdisciplinary teams that deliver services in these areas according to the principles of social and community psychiatry (Peritogiannis, 2019). Although they consider all referrals, they prioritize patients with SMI (Peritogiannis & Mavreas, 2014).

This study involves two MMHUs, namely the MMHU of the prefectures of Ioannina and Thesprotia (MMHU I-T) and the MMHU of Kefalonia, Zakynthos and Ithaca (MMHU KZI). The former delivers services in remote and mountainous areas in Epirus, Northwest Greece, and the latter in three of the Ionian Islands, West Greece.

### *Study procedures*

This is a 6-month prospective study, from April, when the COVID-19 vaccines became widely available for the

Greek population to September 2021. All active patients with SMI (that is schizophrenia-spectrum disorders and bipolar disorder, F20-29 and F31, respectively, according to the International Classification of Disorders, 10th revision) that attended the two MMHUs over this period were enrolled. As active were thought all patients that were regularly attended scheduled follow-up appointments.

The two MMHUs adopted different approaches to patients' vaccination. The MMHU I-T, on the basis of scientific evidence and the recommendations of health authorities, adopted a proactive approach to the patients' vaccination. During the regular follow-up assessment patients were asked whether they were willing to get vaccinated, and if not, the treating team informed them and their caregivers about the benefits of getting vaccinated, encouraged them to do so, and helped them to arrange an appointment, if needed. Vaccination was considered as implemented if the patient received at least one dose. Reasons for patients' refusal to get vaccinated were recorded. Those reasons were divided in four categories, that is, reasons associated to the mental illness (e.g. delusional beliefs, cognitive distortion); reasons that are also encountered to the general population (e.g. false beliefs about vaccination); concerns and fear; other reasons.

In the case of the MMHU KZI the treatment team had a neutral approach toward patients' vaccination. There was no intervention to patients, no discussion on the issue and no encouragement to get vaccinated. That was justified on the basis of patients' autonomy and preference to getting or not vaccinated, and their ability to process the available information by the health authorities and the media. At the end of the study period patients were asked whether or not had got vaccinated, and the reasons for their refusal were recorded as aforementioned. Over the study period, vaccination against COVID-19 was not mandatory for any person in Greece, with the exception of healthcare staff, by early September.

Symptomatology and functioning were not measured over the period of the study, but patients were rather rated as 'stabilized', meaning that they were able to live in the community, they were receiving regular care by the interdisciplinary team and did not need hospitalization. The rationale of not measuring symptomatology was that it could be fluctuated over the study period and could not be readily assessed at the exact time of vaccination. Moreover, the same symptoms that could prevent patients from getting vaccinated, such as negative symptoms (e.g. avolition), could also facilitate vaccination, if a caregiver was in charge. Patients that could not get vaccinated due to medical reasons and those who had been recently infected and did not need to get vaccinated were excluded from the study.

The institutional boards of both MMHUs approved the study and waived the need for patients' informed consent, since the interventions by the MMHU I-T were in line with

the recommendations by health authorities, and the Greek state has launched many campaigns for the vaccination of the population.

### Statistical analysis

We performed the statistical analysis using SPSS version 25.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as mean ( $M$ )  $\pm$  standard deviation ( $SD$ ) and categorical variables were expressed as numbers ( $N$ ) and percentages ( $N\%$ ). We used the chi-squared test to detect whether the proportions for one categorical variable are different among values of the other categorical variable. To compare mean differences between two independent groups  $t$ -test was applied, assuming that the normality hypothesis is satisfied due to the large size of the sample. Age-standardized vaccination rate (ASR) was used to comparing vaccination rates between estimated Greek population (data from ECDC) and our sample, for the age-groups 18–24/25–49/50–59/60–69/70–79/80+. For all tests,  $p$ -value  $< .05$  was considered statistically significant. We used Hedges'  $g$  formula (because the sample sizes are different) to calculate the effect size for independent  $t$ -test and index Cramer's  $V$  (based on the degrees of freedom) for the effect size of the Chi-Square test.

### Results

A total of 198 patients with SMI were enrolled in this study. One patient had been diagnosed with COVID-19 and was excluded from analysis. Two more patients were diagnosed with COVID-19 over the study period, after at least one vaccination dose and were included in the analysis. Accordingly, data were analyzed for 197 patients.

A total of 135 out of 197 (63 out of 94 in the MMHU KZI and 72 out of 103 in the MMHU I-T, 67.0% vs 69.9%, respectively, 68.5% total) patients had been vaccinated. There were no statistically significant differences among the two MMHUs with regards to the vaccination rates of their patients with SMI ( $p = .458$ ).

With regards to the reasons provided by patients ( $n = 62$ ) for not getting vaccinated, fears and concerns were accounted for 29.0% of cases (18 out of 62 non-vaccinated patients). Equal number of patients (18 out of 62, 29.0%) had false beliefs about vaccination that are also encountered to the general population, whereas in 19 out of 62 patients (30.6%) the refusal to get vaccinated had been clearly associated with their symptomatology, mostly positive and cognitive symptoms.

There were not statistically significant differences among patients with schizophrenia spectrum disorders (F20-F29) and patients with bipolar disorder (F31) in vaccination rates ( $p = .974$ ). Also, no statistically significant difference was found among the two MMHUs in terms of gender ( $p = .588$ ), age ( $p = .101$ ), follow up duration

( $p = .984$ ), caregiver ( $p = .247$ ) and history of alcohol and substance abuse ( $p = .686$ ). The educational level of patients was found to be statistically higher in MMHU KZI than in MMHU I-T ( $p < .001$ ). The illness duration ( $p = .029$ ) and the number of previous hospitalizations ( $p = .010$ ) was found to be statistically higher in patients attending the MMHU I-T than in those attending the MMHU-KZI (Tables 1 and 2).

Analysis of the data showed that there was no statistically significant correlation between the percentage of vaccinated patients with SMI and gender ( $p = .987$ ), educational level ( $p = .602$ ), caregiver ( $p = .716$ ), history of alcohol and substance abuse ( $p = .582$ ), illness duration ( $p = .470$ ), number of previous hospitalizations ( $p = .610$ ), and follow up duration ( $p = .401$ ). With regards to age, while the  $p$ -value is marginal ( $p = .061$ ) the effect size is almost moderate ( $g = .292$ ), which means that there is practically an indication that age is related to the level of vaccination (higher age relates to a higher vaccination rate). In all other cases the effect size is low (Tables 3 and 4).

The ASVR index was calculated .953 (CI 95% = 0.80–1.125). The 95% confidence interval of the ASR does include the value '1.0' indicating that the observed number of vaccinated patients of the sample is not statistically significantly lower than the expected number of vaccinated in general Greek population (Table 5).

### Discussion

This is the first study that addresses COVID-19 vaccination rates in patients with SMI in rural Greece, and one of the very few internationally on this topic. From a total of 198 patients that were regularly attended the two MMHUs only three had been infected by the SARS-COV-2 virus over the 6-month study period, a rate of 1.5%. This rate is rather low however conclusions cannot be drawn, due to the small number of infected patients. Large scale international studies have suggested that the risk of SARS-COV-2 infection was significantly higher in patients with SMI (Hassan et al., 2021; Nemani et al., 2021; Wang, Xu et al., 2021). Whether those rates are lower in patients with SMI in rural areas warrants further study. Interestingly, a large-scale retrospective study in Israel, with more than 50,000 participants, found that patients with schizophrenia were less likely to test positive for COVID-19, whereas they were much more likely to be hospitalized for COVID-19, or to experience COVID-19 mortality, compared to controls (Tzur Bitan, Krieger, et al., 2021).

The vast majority of patients in our sample (68.5%) did get vaccinated. Interestingly, vaccination rates in our sample of patients with SMI did not differ from the respective rates in the general population. This is an encouraging finding, given that reports so far have suggested that patients with SMI are being under-vaccinated for COVID-19 compared to the rest of the population (Tzur Bitan, Kridin et al.,

**Table 1.** Patients' demographic and clinical characteristics (categorical variables).

	MMHU				Statistical test	p-Value
	MMHU KZI (n = 94)		MMHU I-T (n = 103)			
	n	%	n	%		
Diagnosis (ICD-10)						
F20-F29	71	75.5	78	75.7	$\chi^2(1)=0.001$	.974
F31	23	24.5	25	24.3		
Vaccination						
No	32	34.0	30	29.1	$\chi^2(1)=0.551$	.458
Yes	62	66.0	73	70.9		
Gender						
Female	41	43.6	41	39.8	$\chi^2(1)=0.294$	.588
Male	53	56.4	62	60.2		
Education						
Illiterate	0	0.0	0	0.0	$\chi^2(2)=19.660$	<.001
Primary	25	26.6	58	56.3		
Secondary	47	50.0	36	35.0		
Tertiary	22	23.4	9	8.7		
Caregiver						
No	21	22.3	34	33.0	$\chi^2(2)=27.980$	.247
Yes	64	68.1	61	59.2		
Family of patients	9	9.6	8	7.8		
History of alcohol/substance abuse						
No	67	71.3	70	68.6	$\chi^2(1)=0.163$	.686
Yes	27	28.7	32	31.4		

**Table 2.** Patients' demographic and clinical characteristics (continuous variables).

	MMHU				Statistical test	p-Value
	MMHU KZI		MMHU I-T			
	M	SD	M	SD		
Age (years)	51.7	12.2	54.7	13.2	$t(195)=-1.650$	.101
Illness duration (years)	21.8	13.3	26.1	13.8	$t(194)=-2.204$	.029
Hospitalizations	2.0	3.1	3.5	4.5	$t(192)=-2.618$	.010
Follow-up duration (years)	6.5	4.4	6.5	4.3	$t(195)=-0.021$	.984

2021). A plausible explanation could be that treatment engaged patients may have more positive attitudes toward vaccination, and may have more contact with primary healthcare services, however, more research is needed to unveil the attitudes of patients with SMI toward vaccination. Research so far has yielded contradictory results. A recent U.S. study suggested that there may be a heightened prevalence of vaccine hesitancy among those with psychiatric illness (Eyllon et al., 2022), whereas another study in Denmark showed that vaccine willingness was only slightly lower amongst patients with mental illness, compared with the general population (Jefsen et al., 2021).

It is not clear in what proportion of cases the decision to get vaccinated was the result of a logical process of information that would be expected in the general population.

However, it has been previously shown that a considerable proportion of patients with SMI in Greece may retain adequate capacity for receiving decisions regarding their treatment, even during acute admissions (Bilanakis et al., 2013, 2017). This could also be the case regarding SMI patients' decision to get vaccinated for COVID-19. Importantly, the patients in the present study were not in an acute phase of their illness, but were rather rated as stabilized and were community-dwelling. With regards to the patients' reported reasons for not getting vaccinated, most are encountered in the general population as well (Castellano-Tejedor et al., 2021; Neumann-Böhme et al., 2020). Indeed, in more than half non-vaccinated patients the refusal to get vaccinated was associated with fears and concerns as well as false beliefs that are encountered in

**Table 3.** Relationship between COVID-19 vaccination and categorical variables.

	Vaccination				p-Value	Effect size	
	Unvaccinated patients (n = 62)		Vaccinated patients (n = 135)				
	n	%	n	%			
Diagnosis (ICD-10)							
F20-F29	52	83.9	97	71.9	$\chi^2(1)=0.330$	.068	.130 (small)
F31	10	16.1	38	28.1			
Gender							
Female	25	40.3	57	42.2	$\chi^2(1)=0.063$	.802	.018 (small)
Male	37	59.7	78	57.8			
Education							
Illiterate	0	0.0	0	0.0	$\chi^2(2)=1.016$	.602	.072 (small)
Primary	23	37.1	60	44.4			
Secondary	29	46.8	54	40.0			
Tertiary	10	16.1	21	15.6			
Caregiver							
No	15	24.2	40	29.6	$\chi^2(2)=0.667$	.716	.058 (small)
Yes	41	66.1	84	62.2			
Family of patients	6	9.7	11	8.1			
History of alcohol/substance abuse							
No	42	67.7	96	71.1	$\chi^2(1)=0.303$	.582	.039 (small)
Yes	20	32.3	39	28.9			

**Table 4.** Relationship between COVID-19 vaccination and continuous variables.

	Vaccination				Statistical test	p-Value	Effect size
	Unvaccinated patients		Vaccinated patients				
	M	SD	M	SD			
Age (years)	50.7	14.0	54.4	12.0	$t(195)=-1.881$	.061	.292 (small to medium)
Illness duration (years)	23.0	14.7	24.5	13.2	$t(194)=-0.724$	.470	.110 (small)
Hospitalizations	6.9	4.7	6.3	4.2	$t(192)=0.511$	.610	.137 (small)
Follow-up duration (years)	3.0	4.5	2.7	3.6	$t(195)=0.842$	.401	.077 (small)

**Table 5.** Age-standardized vaccination rate (ASVR), adjusted to the general Greek population on September 30 of 2021.

Age groups	Vaccinated (at least one dose) in Greek general population	Estimated Greek population (September 30, 2021)	Expected vaccinations	Vaccinated (at least one dose) in sample population	Total sample population	ASVR for COVID-19 vaccination (per 100,000 population)
18–24	438,278	782,452	1.68	2	3	56,013.40
25–49	2,249,179	3,497,414	48.88	43	76	64,309.77
50–59	1,122,138	1,515,472	45.17	49	61	74,045.45
60–69	1,033,878	1,291,651	28.82	26	36	80,043.14
70–79	828,335	1,003,958	14.85	14	18	82,506.94
80+	573,189	773,240	2.22	1	3	74,128.21

the general population. However, interventions may be effective only in cases of fear, whereas false beliefs may be particularly difficult to be challenged. In 30.6% of non-vaccinated patients their refusal could be clearly attributed

to the symptomatology of psychosis. Given that our sample consisted of chronic patients it is not clear what interventions could eliminate well-established delusional beliefs and cognitive distortions that undermine the



patients' ability to process the information regarding vaccination. A recent review article summarizes the possible interventions to overcome hesitancy and improve vaccine acceptance rates in persons with mental illness. The authors highlight the role of psychiatrists and other mental health professionals in discussing this topic with their patients, addressing their concerns and giving accurate information. In order to promote vaccine acceptance among patients with mental health problems it is important to include parents and families of those patients to any interventions. Moreover, psychiatrists could assist primary care providers in determining individual decision-making capacity to provide informed consent for vaccination (Payberah et al., 2022).

There were no associations of patients' vaccination with the examined demographic (gender, education, caregiver) and clinical variables (diagnosis, illness duration, history of alcohol/substance abuse, number of hospitalizations). It seems that there may be other factors that are associated with the patients' vaccination that were beyond the scope of the study. Or, the present sample was not large enough to detect any potential factors. With regards to age, the effect size was almost moderate, which means that age may be related to vaccination (higher age relates to a higher vaccination rate). This is a finding that would be expected, given the rates of physical morbidity in older patients with SMI in rural areas in Greece (Bakola et al., 2022).

There were no statistically significant differences in vaccination rates among patients that attended different MMHUs. It seems that the interventions of the MMHU I-T were not sufficient to change the reluctant patients' attitude toward vaccination. This may be due to that those interventions were not intensive enough to change the patients' opinion. Or, patients with SMI have been already informed enough to make their decisions, regardless of interventions. Other possible explanations should also be considered. The catchment area of the MMHU KZI involves islands that are popular destination for tourists. During the summer of 2021, the Greek state implemented a widely distributed campaign to promote vaccination in islands, so as to be a safe destination for tourists. Such a promotion could have impacted on vaccination acceptance even in persons with SMI in those islands, and may have counterbalanced the absence of specific interventions by the local MMHU. Potential local differences in health literacy should also not be disregarded, but are largely unknown. Interestingly, despite the differences in educational level among patients attending the two MMHUs, education was not associated with vaccination in the present study. It has been suggested that medical services should assume a more proactive role in promoting vaccination to those patients (Tzur Bitan, Krieger, et al., 2021). Perhaps their suggestions to patients are more relevant than those of the treating mental health teams, such as the

MMHUs. According to some researchers, public health campaigns and a targeted vaccination program focusing on people with mental health problems in collaboration with primary care providers, could raise more awareness about the benefits of vaccines and increase acceptance rates in those patients (Payberah et al., 2022).

The present study involved community-dwelling patients with SMI. There may be differences in COVID-19 vaccination rates in patients attending different treatment settings across different countries. A recent study in Belgium found that as high as 93% of inpatients in a university psychiatric hospital accepted vaccination. Of those, 28.4% had schizophrenia or bipolar disorder, however, diagnosis was not found to be associated with vaccination acceptance (Mazereel, Vanbrabant, Desplenter & De Hert, 2021). Another study in the UK, in a medium secure psychiatric hospital recorded that 68 out of 85 patients (80%) who had capacity to decide about COVID-19 vaccination, decided to uptake the vaccine (Gibbon et al., 2021). With regards to patients with mental disorders attending residential facilities and community care settings, a recent study in Belgium found that vaccine uptake was high and comparable to the general population, with a total vaccination rate of 91.7% (Mazereel, Vanbrabant, Desplenter, Detraux et al., 2021). Given that vaccination willingness has been shown to be highly variable between countries (Lazarus et al., 2021), and that data on patients with SMI involve different settings and countries, direct comparisons with the results of the present study cannot be made. However, there is preliminary evidence that patients with mental illness may be as willing as the general population to uptake COVID-19 vaccination.

## Limitations

This study is not an epidemiologic survey. It involves patients with SMI that are regularly attending rural community mental health services. Vaccination rates of patients that are not in contact with such services are indeed unknown. On the other hand, this is a study on real world patients with SMI residing in rural and deprived areas. Importantly, it has been previously shown that MMHUs in rural Greece may effectively engage to treatment most referred patients with SMI (Peritogiannis et al., 2013), thus the present findings may involve the majority of community-dwelling patients with SMI in rural areas. Whether these results are applicable in similar settings in other regions in rural Greece is also unknown, although they are probably relevant for all similar settings despite the reported differences among the MMHUs in rural Greece (Peritogiannis et al., 2022). Symptomatology and functioning were not assessed in the present study. However, we have previously found that a substantial proportion of treatment-engaged patients with SMI in rural Greece have a favorable long-term outcome (Peritogiannis

et al., 2019), and satisfactory functioning, regardless of the ongoing symptomatology (Peritogiannis & Nikolaou, 2020). Whether specific aspects of symptomatology and levels of functioning are associated with patients' vaccination could be the subject of future research.

### Implications for future research

Given the duration of the COVID-19 pandemic and the reported impact on the health of patients with SMI, vaccination of those patients is considered to be a priority (De Hert et al., 2021; Suhas, 2021). It would be relevant for the optimal care of those patients to unveil the factors that are associated with the patients' willingness to get vaccinated. Similarly, the environmental factors that could interfere with the patients' vaccination, such as access to healthcare, should be the subject of future research. Understanding the phenomenon of low vaccination rates in patients with SMI could guide the interventions of mental health and other health professionals and policy makers toward the elimination of vaccination disparities. This would be particularly relevant in rural residents with SMI.

### Conclusion

Vaccination of the whole population against COVID-19 is important for the elimination of the pandemic, and may be even more relevant in patients with SMI. In the present sample of treatment-engaged rural patients vaccination rates appear to be satisfactory. There were no differences in vaccination rates with regard to the interventions (limited to inform patients and caregivers about the benefits of vaccination) that were applied to enhance vaccination. It seems that other forms of intervention should be applied to reluctant patients to modify their attitudes toward vaccination, and this should be the subject of future research.

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