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Research paper

Symptoms of anxiety and depression during the COVID-19 pandemic in six European countries and Australia – Differences by prior mental disorders and migration status

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ABSTRACT

Background: Little is known about changes of mental health during the COVID-19 pandemic in potentially disadvantaged groups. We investigated changes in anxiety and depression symptoms during the first year of the pandemic in six European countries and Australia by prior mental disorders and migration status.
Methods: Overall, 4674 adults answered a web-based survey in May–June 2020 and were followed by three repeated surveys up to February 2021. Information on psychosocial, financial and demographic, living conditions, prior mental disorders, depression and anxiety symptoms during the pandemic and migration status was collected. Weighted general estimation equations modelling was used to investigate the association between prior mental disorders, migration status, and symptoms over time.
Results: Most participants were <40 years old (48%), women (78%) and highly educated (62%). The baseline prevalence of depressive and anxiety symptoms ranged between 19%–45% and 13%–35%, respectively. In most countries, prevalence rates remained unchanged throughout the pandemic and were higher among people with prior mental disorders than without even after adjustment for several factors. We observed interactions between previous mental disorders and symptoms of anxiety or depression over time in two countries. No difference by migration status was noted.

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Limitations: Convenience sampling limits generalizability. Self-assessed symptoms of depression and anxiety might involve some misclassification.
Conclusions: Depression and anxiety symptoms were worse among individuals with prior mental disorders than without, but there was no clear trend of worsening mental health in the observed groups during the observed period.

1. Introduction

The current SARS-CoV-2 (also called as COVID-19) pandemic still is a major global health threat. As the World Health Organization reported on the 24th August 2021, there have been more than 211 million cases and 4.4 million deaths confirmed worldwide (*WHO Coronavirus (COVID-19) Dashboard*), with numbers increasing daily. The global spread has been rapid, with over 209 countries reporting at least one case.

A pandemic is considered to be one of the most difficult and stressful events to manage in terms of public health (Brewin et al., 2000; Maunder, 2009; Brooks et al., 2020). The COVID-19 pandemic has been forcing millions of people to change their lives, to work from home, to practice physical and social distancing, and in many cases face uncertainty regarding their financial/work situation or risk of infection. Worries of being infected, strict public health measures including lockdowns, school closures, and negative economic consequences may indeed have affected mental health (Frasquilho et al., 2016).

Previous epidemics have often resulted in worsening mental health of the affected population (Brewin et al., 2000; Maunder, 2009; Peng et al., 2010; Brooks et al., 2020). But so far, the results covering the first half a year of the current COVID-19 pandemic are mixed concerning the mental health consequences (Kunzler et al., 2021). Studies from some European countries showed an increase in anxiety (Kwong et al., 2020), depression (Swedish Public Health Agency, 2021) and other forms of mental ill-health (Daly et al., 2020; Niedzwiedz et al., 2021; Novotný et al., 2020) during the first months of the pandemic (April and May 2020) compared to earlier years. Other studies from the US, UK, Canada, Ireland and Sweden conducted in different populations reported no changes of symptoms of anxiety and depression during the first months of the pandemic compared with a year earlier (Katz et al., 2020; Kivi et al., 2021; Kwong et al., 2020). One study even showed that the prevalence of symptoms of depression and anxiety actually decreased during the period from March to August 2020 (Fancourt et al., 2021). Also the number of completed suicides appears to have been unaffected or decreasing in the period from April to July 2020 in 21 investigated countries (Pirkis et al., 2021). However, there is a need of a more comprehensive analysis, how different aspects of mental health, such as depressive and anxiety symptoms changes during the pandemic in a longer time perspective, that can investigate the question beyond the initial months of the pandemic.

Countries have been affected differently by the pandemic both in magnitude and timewise and they also used different public health measures in order to contain the effects of the pandemic, mostly with the goal of decreasing the number of contacts between individuals. Some countries, such as Spain, Italy and Germany established and maintained strict lockdowns for lengthy periods of time, while other countries such as Sweden have implemented fewer mitigation strategies without lockdown measures (*Dashboard on Government Responses to COVID-19 and the Affected Populations*; *Policy Responses to the Coronavirus Pandemic*). Stricter lockdowns might have affected mental health to a larger extent by increasing separation, loneliness and limiting free movement (Gan et al., 2020; Holmes et al., 2020). Other public health measures such as closure of childcare facilities and schools might have put extra stress on families and especially on women with young children (Calvano et al., 2021; Zoch et al., 2021).

These differences in the course of the pandemic and public health mitigation measures between countries might lead to somehow different mental health trajectories over time in each country.

Individual level factors may influence the likelihood of negative mental health outcomes in the affected population. For example, people with previous mental disorders have been shown to be a particularly vulnerable group (Daly et al., 2020; Every-Palmer et al., 2020; Holman et al., 2020) and that there seems to be an association between history of affective disorders and level of depressive and anxiety symptoms among university students after lock down measures in the current pandemic (Woon et al., 2021). Beside their genetic and biological susceptibility to stress (Smoller, 2016), there might be several factors related to the pandemic that could lead to a worsening mental health development in individuals with compared to those without previous mental disorders. First, cautionary measures to combat the spread of the virus like physical distancing may result in social isolation and negatively impact symptoms in patients with mental disorders (Brooks et al., 2020). Further fear of contamination at healthcare facilities may cause their underutilization, leading to missed routine check-ups, therapy sessions, access to and follow-up of pharmacological treatment eventually resulting in a poor prognosis (Hoyer et al., 2021; Lucero et al., 2020; Moynihan et al., 2021; Sheridan Rains et al., 2021; WHO Report, 2020). Moreover, people with mental disorders might be affected by the reduced capacity to receive mental health services in clinics, which have reduced their activities due to the deployment of personnel to treat patients suffering from COVID-19 (Hoyer et al., 2021; Sheridan Rains et al., 2021; WHO Report, 2020). Still, no studies to date investigated how symptoms of anxiety and depression changed during the COVID-19 pandemic among individuals with and without previous mental illness in several countries with a similar social, cultural and economic background but differently affected by the pandemic.

Another vulnerable group with heightened rates of mental disorders prior to the pandemic are migrants (Spiritus-Beerden et al., 2021). Given the adverse consequences of the COVID-19 outbreak in some areas of the economy and increases in unemployment in some countries, this pandemic might have an additional adverse effect on social disadvantage in migrants, as they were already at a higher risk to be unemployed or for underemployment (Helgesson et al., 2019). This in turn might increase the risk of developing mental illness or worsening already existing symptoms. Despite the higher prevalence of certain mental disorders, several studies have shown that migrants are less likely to be users of mental health services (Björkenstam et al., 2020; Satinsky et al., 2019). Barriers to such services include socio-culturally determined stigma of mental disorders, lack of knowledge about and trust in these services, language obstacles as well as limited financial resources, among others (Björkenstam et al., 2020; Kiselev et al., 2020). Several circumstances related to the ongoing pandemic might have therefore led to even lower rates of mental health care utilisation in migrants, which additionally contributes to a worse prognosis of the mental illness.

We aimed to evaluate whether the course of depression and anxiety symptoms during the current COVID-19 outbreak changed over time and differs between countries with different mitigation strategies and whether being an immigrant in a country or having a pre-existing mental disorder is associated with worse mental health trajectories in the different countries. We hypothesized that symptoms of depression and anxiety would worsen over time in line with worsening socio-economic and psychosocial consequences of the pandemic, particularly in countries with more severe or long-lasting lock-downs. Moreover, we hypothesized that estimates of depressive and anxiety symptoms would be higher in individuals with prior mental disorders and immigrants and that the discrepancies would increase over time during the pandemic.

2. Methods

2.1. Design and study population

This study is nested in the COMET (Covid-19 Mental Health Survey) study that was established by a consortium including 16 research institutes and universities from 14 countries. The study was established at the beginning of the COVID-19 pandemic in 2020 and a web-based questionnaire was released in May and July of 2020 in 14 countries. Due to the urgency and multinational feature of the study, random population sampling was not possible. Therefore, convenience sampling was applied by recruiting participants through different social and written media. Individuals who were at least 18 years old at the beginning of the study, consented online and lived in the countries of interest were eligible. After the baseline survey, respondents were invited to complete follow-up questionnaires 3 (September–October), 6 (December 2020 – January 2021) and 9 (March–April 2021) months later. The participants answered questions about their socio-demographic, economic and living situation, migration status, life-style, social values, psychological characteristics, a series of pandemic-related questions, previously diagnosed mental disorder and current symptoms. The questionnaire was spread in ten different languages (Dutch, English, German, Italian, French, Spanish, Swedish, Turkish, Cantonese and Bahasa Indonesia).

For the present study we included only countries with a substantial sample size ($n > 200$) and with a similar economic developmental state according to the World Development Indicators (World Development Indicators, *2021*) to ensure comparability: these countries were Australia, France, Germany, Italy, Netherlands, Spain and Sweden. We excluded individuals with no valid answer on age and/or those who defined their gender as "other" (in total $n = 35$). This resulted in 4674 individuals answering the questionnaire of the first wave, 2862 the second, 2730 the third and 2540 the fourth. Drop-out during follow-up was largest in Australia (51%, 53%, and 56%, respectively) and lowest in Sweden (27%, 30% and 31%, respectively).

The COMET study was approved by the ethical review board of the Faculty of Behavioral and Movement Sciences of the Vrije Universiteit Amsterdam (VCWE-2020-077), the ethical review board in Sweden (Dnr 2020-02157), the ethical review board of the University of Verona (UNIVR n8/2020) and by the Ethics Committee of the Department of Human Neurosciences - Sapienza University of Rome, Italy (approval n° 02/2020). The French contribution to the COMET consortium is in accordance with French regulations concerning the *Comité de Protection des Personnes* (CCP), the *Règlement Général sur la Protection des Données* (RGPD) and the *Informatique et Libertés* law.

2.2. Outcome measurements

Mental health symptoms were assessed at every measurement point (baseline (T0), and during the three follow up measures (T1, T2, T3). Depressive symptoms were assessed by the 9-item Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001). Responses for each item vary on a 0–3 scale and the total scores ranged from 0 to 27, with higher scores indicating more severe depressive symptoms. We used the cut-off by >10 and ≤ 10 to distinguish between individuals with moderate to severe and individuals with no or mild depressive symptoms, respectively (Kroenke et al., 2001). Validated versions were available in English (Kroenke et al., 2001), French (Carballeira et al., 2007), German (Löve et al., 2013), Dutch (van Steenbergen-Weijenburg et al., 2011), Italian, and Swedish (Patient Health Questionnaire (PHQ) Screeners). There was no validated translation available in Spanish, but the PHQ-9 was used previously with good psychometric properties to detect major depression among primary care patient population (Muñoz-Navarro et al., 2017). Symptoms of anxiety were assessed by the 7-item Generalized Anxiety Disorder scale (GAD-7) (Spitzer et al., 2006). Responses for each item score are on a 0–3 scale, which results in a total score range of 0–21, with higher scores indicating more severe anxiety symptoms. We used the recommended cut-off by >10 and ≤10 for use in the general population in order to identify individuals with moderate to severe anxiety symptoms (Spitzer et al., 2006). Validated translations were available in all languages: in English (Spitzer et al., 2006), French (Micoulaud-Franchi et al., 2016), German (Löwe et al., 2008), Dutch (Donker et al., 2011), Italian, Spanish, and Swedish (Patient Health Questionnaire (PHQ) Screeners).

2.3. Covariates

We considered the following covariates in this study: receipt of a diagnosis of mental disorder in health care prior to the pandemic, migration status (defining immigrant if the country of residence was different from the country of birth), gender, age, relationship status, type of living area, having children, education, number of household members, living with a household member 65 years or older, existing chronic somatic condition, and social support, measured by the three items Oslo Social Support Scale (OSSS-3) and categorized using the cut-offs validated for the general population (Kocalevent et al., 2018). A validated version of the questionnaire was available in English and in Dutch (Kocalevent et al., 2018). The English version was translated to the other languages. All covariates were assessed at baseline, social support was additionally assessed also during the follow-up. Categorization of the variables is presented at Table 1.

2.4. Statistical analysis

All analyses were conducted separately for each country. We imputed missing values on the PHQ-9, GAD-7 and OSSS-3 scales using corrected item mean substitution by each time point, where the percentage of missing items did not exceed 50% (Bernaards and Sijtsma, 2000). For the remaining covariates if the baseline value was missing, and the variable was assessed later during the follow-up the missing values were replaced using the follow-up information. Descriptive statistics were presented for all study variables at baseline and for symptoms of depression and anxiety in all waves through the study. We also plotted the distribution of study participants with anxiety and depressive symptoms respectively throughout the study waves and performed and tested for linear trends.

For further analysis to address the remaining missing baseline covariate values for time-fixed covariates and missing values for the time-varying covariates, we used multiple multivariate imputations by chain equations (MICE) (van Buuren and Groothuis-Oudshoorn, 2011). Chain equations impute missing values for each variable and we used covariates and outcome values as predictors for the imputation of the covariates with missing values. We created 50 imputed datasets, ran all the analysis on each of them and pooled the results by using Rubin's rules (Rubin, 1987). As longitudinal studies on mental health outcomes are prone to selective loss of individuals with mental disorders during the follow-up (Czeisler et al., 2021), we calculated inverse probability censoring weights (IPCWs) for each respondent to ameliorate attrition due to possible selective dropouts between the follow-up surveys. The IPCWs were estimated using a binary logistic regression with drop out vs. no drop out in the following wave as the dependent variable and survey covariates as explanatory factors. The estimation was performed for each wave (T1, T2, T3) separately. To decide which covariates to include in the IPCW models (i.e. age, gender, education, relationship status, type of living area, having children, education, number of household members, living with a household member 65 years or older, existing chronic somatic condition and social support) Akaike's information criterion (AIC) was used when fitting in all possible models. However, age, gender and level of education were included in all models as these factors have been shown to influence participation and participation persistence in voluntary surveys (Cheung et al., 2017). The IPCWs were derived from the model with the lowest AIC. To minimise

Table 1
Cohort characteristics at baseline presented by countries before multiple imputation with chain equations.

Variables	Total (***N*** = 4674)	Australia (***n*** = 713)	France (***n*** = 680)	Germany (***n*** = 627)	Italy (***n*** = 1387)	Netherlands (***n*** = 602)	Spain (***n*** = 376)	Sweden (***n*** = 289)
Age								
18–30	1321 (28%)	69 (10%)	120 (18%)	231 (37%)	414 (30%)	211 (35%)	229 (61%)	47 (16%)
31–40	928 (20%)	100 (14%)	120 (18%)	105 (17%)	322 (23%)	149 (25%)	71 (19%)	61 (21%)
41–50	830 (18%)	147 (21%)	144 (21%)	88 (14%)	220 (16%)	119 (20%)	46 (12%)	66 (23%)
≥51	1595 (34%)	397 (56%)	296 (44%)	203 (32%)	431 (31%)	123 (20%)	30 (8%)	115 (40%)
Gender								
Female	3622 (78%)	578 (81%)	531 (78%)	541 (86%)	964 (70%)	458 (76%)	300 (80%)	250 (87%)
Male	1040 (22%)	133 (19%)	146 (22%)	85 (14%)	420 (30%)	141 (24%)	76 (20%)	39 (13%)
Missing answers	12 (0.3%)	2 (0.3%)	3 (0.4%)	1 (0.2%)	3 (0.2%)	3 (0.5%)	0 (0%)	0 (0%)
Relationship status								
Not in a relationship	1474 (32%)	276 (39%)	216 (32%)	252 (40%)	378 (28%)	137 (23%)	134 (36%)	81 (28%)
Married/cohabiting	3156 (68%)	428 (60%)	462 (68%)	371 (60%)	990 (72%)	458 (77%)	239 (64%)	208 (72%)
Missing answers	44 (0.9%)	9 (1.3%)	2 (0.3%)	4 (0.6%)	19 (1.4%)	7 (1.2%)	3 (0.8%)	0 (0%)
Type of living area								
Urban	2660 (57%)	168 (24%)	349 (52%)	363 (58%)	1114 (81%)	268 (45%)	273 (73%)	125 (44%)
Suburban and rural	1983 (43%)	541 (76%)	323 (48%)	261 (42%)	265 (19%)	332 (55%)	99 (27%)	162 (56%)
Missing answers	31 (0.7%)	4 (0.6%)	8 (1.2%)	3 (0.5%)	8 (0.6%)	2 (0.3%)	4 (1.1%)	2 (0.7%)
Have children								
Yes	2148 (46%)	440 (62%)	428 (63%)	238 (38%)	536 (39%)	244 (41%)	78 (21%)	184 (64%)
No	2499 (54%)	268 (38%)	249 (37%)	388 (62%)	836 (61%)	356 (59%)	297 (79%)	105 (36%)
Missing answers	27 (0.6%)	5 (0.7%)	3 (0.4%)	1 (0.2%)	15 (1.1%)	2 (0.3%)	1 (0.3%)	0 (0%)
Number of people living in the household								
One	1044 (22%)	183 (26%)	146 (22%)	184 (29%)	322 (23%)	106 (18%)	31 (8%)	72 (25%)
Two	1694 (36%)	275 (39%)	256 (38%)	218 (35%)	465 (34%)	246 (41%)	129 (34%)	105 (36%)
Three or more	1931 (41%)	255 (36%)	275 (41%)	225 (36%)	598 (43%)	250 (42%)	216 (57%)	112 (39%)
Missing answers	5 (0.1%)	0 (0%)	3 (0.4%)	0 (0%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)
Living together with someone over 65 years old in the same household								
Yes	640 (14%)	120 (17%)	128 (19%)	50 (8%)	239 (17%)	34 (6%)	37 (10%)	32 (11%)
No	4022 (86%)	591 (83%)	552 (81%)	575 (92%)	1141 (83%)	567 (94%)	339 (90%)	257 (89%)
Missing answers	12 (0.3%)	2 (0.3%)	0 (0%)	2 (0.3%)	7 (0.5%)	1 (0.2%)	0 (0%)	0 (0%)
Longstanding somatic illness or chronic condition								
Yes	1313 (29%)	354 (50%)	159 (24%)	186 (30%)	341 (25%)	112 (19%)	68 (19%)	93 (32%)
No	3271 (71%)	352 (50%)	502 (76%)	434 (70%)	1006 (75%)	482 (81%)	301 (81%)	194 (68%)
Missing answers	90 (1.9%)	7 (1.0%)	19 (2.8%)	7 (1.1%)	40 (2.9%)	8 (1.3%)	7 (1.9%)	2 (0.7%)
Level of achieved education								
Elementary school or no former education	220 (5%)	29 (4%)	47 (7%)	81 (13%)	26 (2%)	9 (1%)	18 (5%)	10 (3%)
Secondary school	1566 (34%)	307 (43%)	255 (38%)	271 (43%)	340 (25%)	162 (27%)	152 (40%)	79 (27%)
Higher level education	2883 (62%)	377 (53%)	377 (56%)	273 (44%)	1020 (74%)	430 (72%)	206 (55%)	200 (69%)
Missing	5 (0.1%)	0 (0%)	1 (0.1%)	2 (0.3%)	1 (0.1%)	1 (0.2%)	0 (0%)	0 (0%)
Perceived social support								
Poor	1321 (28%)	317 (44%)	169 (25%)	264 (42%)	289 (21%)	118 (20%)	92 (24%)	72 (25%)
Moderate	2289 (49%)	283 (40%)	308 (45%)	277 (44%)	790 (57%)	292 (49%)	200 (53%)	139 (48%)
Strong	1058 (23%)	113 (16%)	201 (30%)	86 (14%)	305 (22%)	191 (32%)	84 (22%)	78 (27%)
Missing answers	6 (0.1%)	0 (0%)	2 (0.3%)	0 (0%)	3 (0.2%)	1 (0.2%)	0 (0%)	0 (0%)
Diagnosed with mental disorders before the pandemic								
Yes	1172 (25%)	439 (62%)	64 (9%)	226 (36%)	163 (12%)	118 (20%)	68 (18%)	94 (33%)
No	3493 (75%)	272 (38%)	613 (91%)	401 (64%)	1222 (88%)	483 (80%)	307 (82%)	195 (67%)
Missing answers	9 (0.2%)	2 (0.3%)	3 (0.4%)	0 (0%)	2 (0.1%)	1 (0.2%)	1 (0.3%)	0 (0%)
Immigration status								
Not immigrant	3883 (85%)	512 (76%)	559 (85%)	563 (91%)	1275 (95%)	397 (67%)	341 (92%)	236 (83%)
Immigrant	659 (15%)	166 (24%)	99 (15%)	57 (9%)	61 (5%)	198 (33%)	31 (8%)	47 (17%)
Missing answers	132 (2.8%)	35 (4.9%)	22 (3.2%)	7 (1.1%)	51 (3.7%)	7 (1.2%)	4 (1.1%)	6 (2.1%)
Have symptoms of depression[a]								

(*continued on next page*)

Table 1 (*continued*)

Variables	Total (***N*** = 4674)	Australia (***n*** = 713)	France (***n*** = 680)	Germany (***n*** = 627)	Italy (***n*** = 1387)	Netherlands (***n*** = 602)	Spain (***n*** = 376)	Sweden (***n*** = 289)
At baseline	1362 (29%)	320 (45%)	164 (24%)	247 (39%)	302 (22%)	116 (19%)	149 (40%)	64 (22%)
First follow-up	617 (22%)	140 (40%)	62 (14%)	140 (31%)	115 (16%)	63 (15%)	61 (24%)	36 (17%)
Second follow-up	720 (26%)	116 (35%)	104 (24%)	167 (38%)	153 (21%)	72 (19%)	65 (29%)	43 (21%)
Third follow-up	643 (25%)	107 (34%)	90 (21%)	156 (37%)	136 (22%)	57 (17%)	57 (27%)	40 (20%)
Have symptoms of anxiety[a]								
At baseline	986 (21%)	252 (35%)	104 (15%)	188 (30%)	221 (16%)	76 (13%)	100 (27%)	45 (16%)
First follow-up	475 (17%)	91 (26%)	49 (11%)	109 (24%)	92 (13%)	50 (12%)	49 (20%)	35 (17%)
Second follow-up	504 (18%)	73 (22%)	70 (16%)	112 (26%)	129 (18%)	40 (11%)	46 (20%)	34 (17%)
Third follow-up	464 (18%)	72 (23%)	62 (15%)	114 (27%)	107 (17%)	42 (12%)	38 (18%)	29 (15%)

[a] Percentage among those who answered at each specific wave.

variance and to avoid extreme values we stabilized the IPCWs (Robins et al., 1995).

We then used generalized estimating equation on the imputed and weighted datasets to analyse the association between mental disorders prior to the pandemic (exposure), migration status (exposure) and the odds of symptoms of anxiety or depression during the pandemic. We ran the models separately for mental disorders prior to the pandemic and migration status as well as symptoms of depression and symptoms of anxiety for each specific country. We adjusted our models for time (time points for four waves), age, gender, relationship status, type of living area, having children, education, number of household members, living with a household member 65 years or older, existing chronic somatic condition, and social support. We included a time by exposure interaction in each model. In the presence of a significant interaction (defined as p-values<0.05) we performed simple main effects (Salkind, 2021) to investigate the difference between symptoms of depression or anxiety at each time point and the changes over time within levels of exposure. When the p-value for test for interaction were ≥ 0.05 we refitted the model without the interaction. Multi-collinearity between covariates was evaluated using the generalized variation inflation factor (Fox and Monette, 1992). We presented the association between mental disorders prior to the pandemic and migration status and the outcomes of interest over time in the fully adjusted models graphically using marginal effect graphs by the average values of the other covariates.

Data management was conducted in SAS (version-9.4), statistical analyses were conducted in R (version 4.1.0) with the MICE (van Buuren and Groothuis-Oudshoorn, 2011) and geepack (Højsgaard et al., 2005) packages.

3. Results

The distribution of study variables before imputation is presented in Table 1 by countries. Overall, 48% of the study participants were younger than or equal to 40 years old, 78% were women and 62% had a university or college degree (Table 1). In total, 25% of the participants were diagnosed with a mental disorder prior to the pandemic and 15% reported of residing in a different country than their country of birth at baseline. There were some differences concerning the distribution of study variables between countries. Australia, France and Sweden had the highest proportions of respondents over the age of 50, and Sweden had the highest proportion of women in the study sample (87%). The highest proportion of participants with college or university degree was in Italy (74%). Participants in Australia reported the highest frequency of previous mental disorders (62%) and those in France reported the lowest (9%). Participants in the Netherlands indicated most frequently (33%) that they lived in a different country than their country of birth. In Italy only 5% were migrants.

At baseline the prevalence estimates for depressive symptoms ranged between 19% and 45% in the different countries and for anxiety symptoms between 13% and 35% (Table 1, Supplement Fig. 1). We observed a linear trend in Australia and Spain with slightly decreasing prevalence estimates for symptoms of depression over time ($p < 0.001$ and $p = 0.002$), respectively. Concerning symptoms of anxiety, slightly decreasing patterns were seen for Australia ($p < 0.001$) and Spain ($p = 0.04$). Among individuals who reported previous mental disorders there was a higher proportion of symptoms of depression and anxiety in the study waves in the raw data in most countries (Supplement Fig. 2). In Italy this difference was relatively small. In most countries there were no or small differences in the prevalence of symptoms of depression and anxiety throughout the study waves by migration status in unadjusted analyses (Supplement Fig. 3).

The adjusted prevalence estimates of symptoms of depression and anxiety based on the weighted and imputed data over time by prior mental disorders and migration status are presented in Fig. 1 and Fig. 2. In general, the difference in prevalence estimates between individuals with prior mental disorders and those without decreased in the adjusted models for both outcome measures. Only in two countries we observed different patterns in the temporal changes of the prevalence estimates of having symptoms of depression and anxiety among individuals with and without prior mental disorders during the observed periods. There was a significant interaction between previous mental disorders and symptoms of anxiety over time in Germany ($p = 0.01$) and between previous mental disorders and symptoms of depression in Spain ($p = 0.04$) (Supplement table). In Germany individuals with prior mental disorders showed decreasing prevalence estimates over time, while among those who had no prior mental disorders there was no change in the prevalence of anxiety symptoms during this period. In Spain similarly, the decrease of symptoms of depression was slightly larger among those with prior mental disorders compared with those without from baseline to the third follow-up measure. In other countries, there were no significant differences in time trends. For symptoms of depression the analyses showed that the average difference over the study period between individuals with and without previous mental disorders was highest in the Netherland (adjusted Odds Ratio (OR): 4.0, 95% CIs: 2.7, 6.0) and lowest in Italy (adjusted OR 1.6, 95% CIs: 1.1, 2.2), data not shown. For symptoms of anxiety the highest estimate was observed in Sweden (adjusted OR: 6.5, 95% CIs: 3.5, 12.1) and the lowest in Italy (adjusted OR: 1.6, 95% CIs: 1.1, 2.2) when comparing study participants with and without previous mental disorders (data not shown).

We did not observe any substantial interaction between migration status and changes in symptoms of depression or anxiety during the pandemic in any country (Supplement Table 1).

We also did not observe differences in symptoms of depression and anxiety during the observational period by migration status except a marginal difference in the Netherlands where migrants on average had a slightly higher probability of symptoms of depression and anxiety compared with the host population during the study period (adjusted OR for the simple main effect analysis: 2.0, 95% CIs:1.3, 3.0 and 1.8, 95% CIs: 1.2, 2.9, respectively), data not shown.

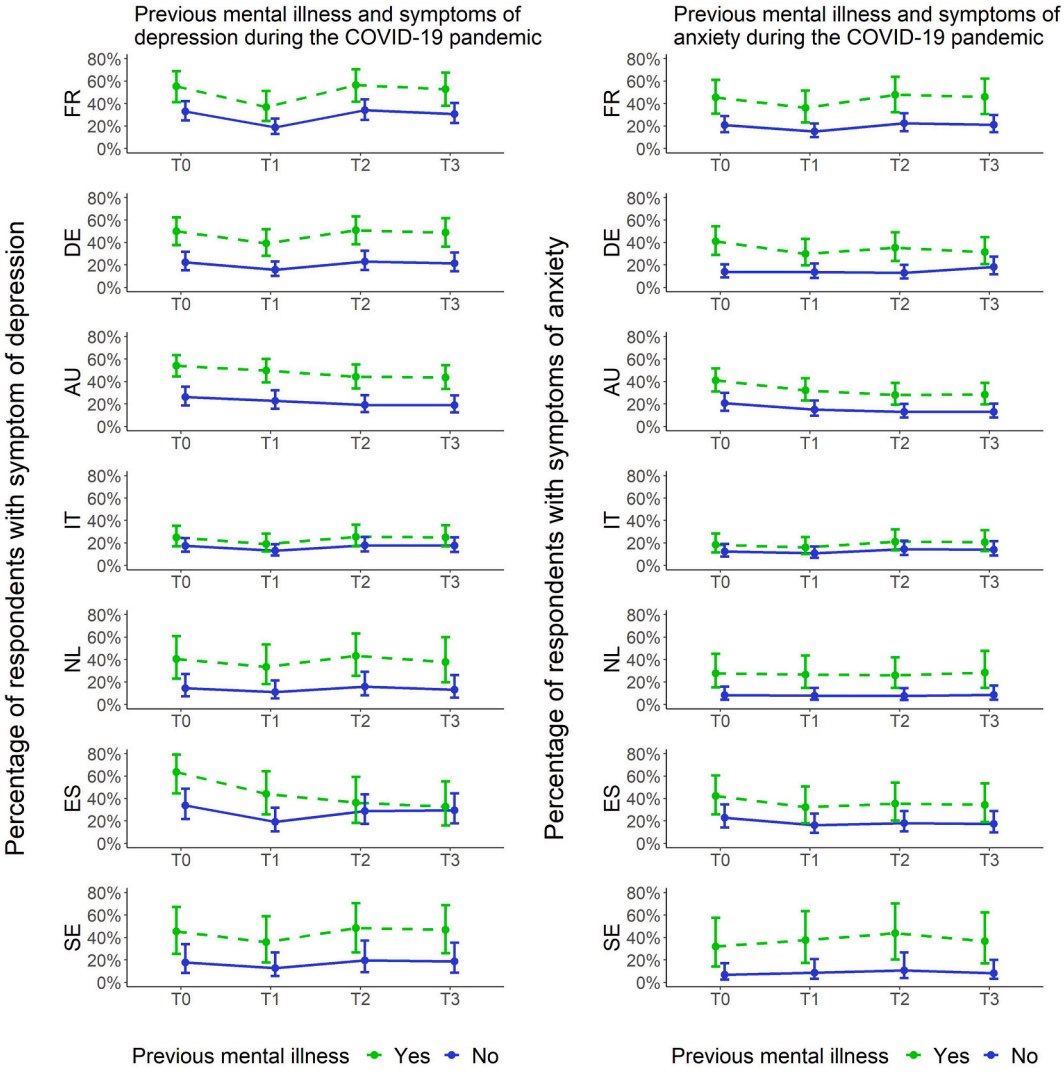


Fig. 1. Prevalence estimates of individuals with symptoms of depression and anxiety in all study waves by previous mental disorders, weighted and imputed data in the fully adjusted model.

4. Discussion

Point estimates for depressive and anxiety symptoms differed considerably between the countries, and were stable across time in most countries (April 2020 to February 2021). In all countries, individuals with prior mental disorders had higher depression and anxiety prevalence estimates during the study period. This difference decreased when adjusting for sociodemographic, socioeconomic factors, somatic illness and social support. In Germany and in Spain the trends of symptoms of anxiety or depression over the study period differed by prior mental disorders, respectively, but not in other countries. There was no evidence for different time trends in symptoms of depression and anxiety over time by migration status. Furtermore, we did not find substantial overall differences in symptoms of depression and anxiety between the two migrant groups.

We found considerable differences regarding prevalence estimates of depressive and anxiety symptoms between different countries, which is in line with previous reports (Kessler et al., 2009; Stein et al., 2017). As expected, prevalence estimates for individuals with previous mental disorders were higher than those for individuals without such a history (Daly and Robinson, 2021; Every-Palmer et al., 2020; Holman et al., 2020). We could now also show that this difference varied considerably between countries. While baseline prevalence estimates ranged from approximately 13% to around 63% for those without and with prior mental disorders in France, Germany and Australia, there was a much smaller difference in Italy (21% compared to 34%). Besides potential country-specific reporting differences due to convenience sampling, chance, difference in mental health awareness or cultural factors, these discrepancies could also arise from varying social integration of individuals with mental disorders, responsiveness of social insurance measures and mental health care services during the pandemic (Bernaards and Australian Institute of Health and Welfare, 2020; Kousoulis et al., 2020; OECD, 2021; Report WHO, 2020). The differences in reported symptoms between those with and without prior mental disorders throughout the pandemic was smaller after controlling for many sociodemographic factors, somatic illness and social support as well as statistically compensating for the drop out of responses across waves. These findings suggest that these factors (age, gender, education, living conditions, somatic illness and perceived social support) are strong contributing factors for adverse mental health during the pandemic among prior psychiatric patients.

We observed a linear trend in the prevalence estimates of symptoms of depression and anxiety over the course of the first year of the pandemic in some countries, but the difference of prevalence rates between baseline and the last follow-up measures exceeded 10% only in Australia. These findings may be explained by the difference of the

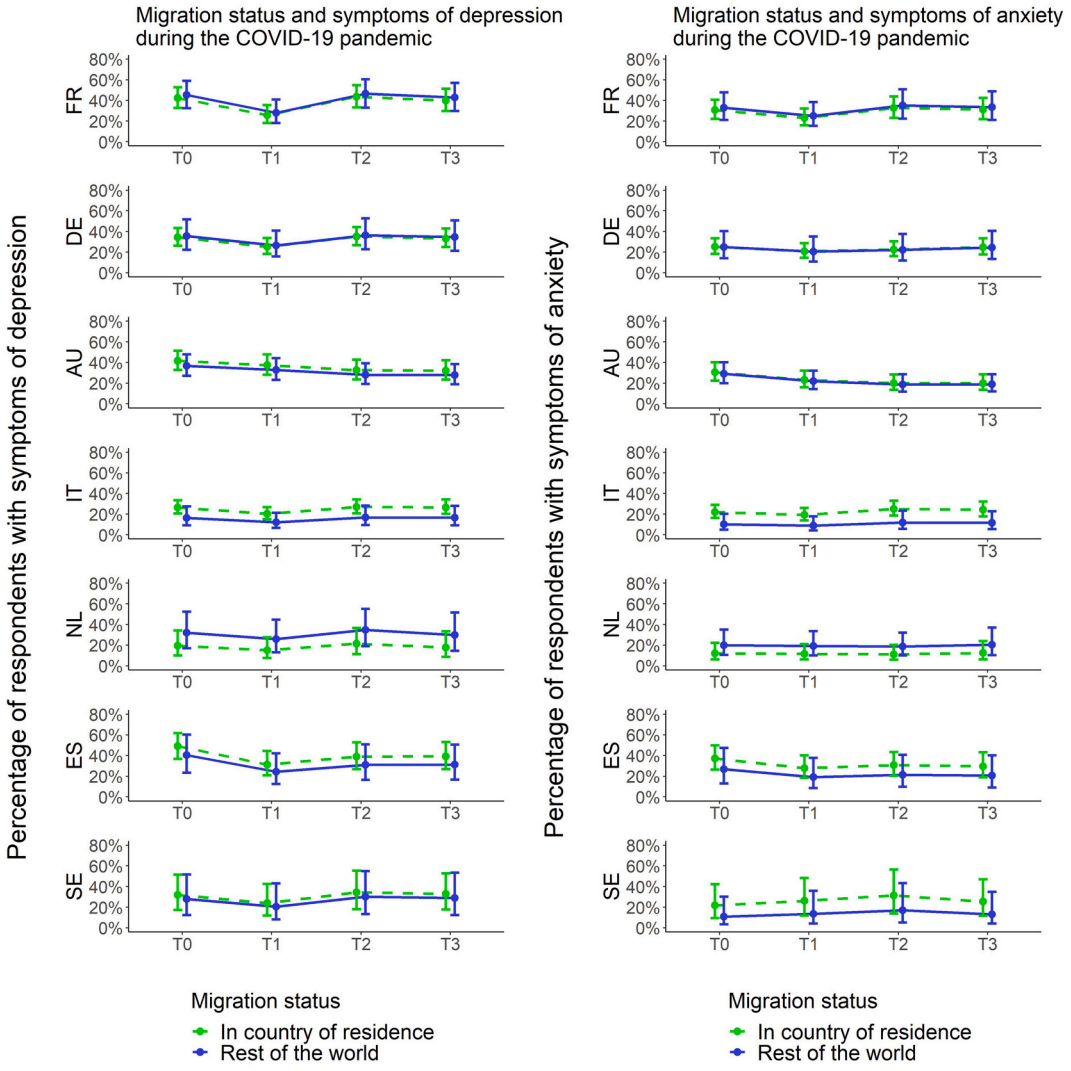


Fig. 2. Prevalence estimates of individuals with symptoms of depression and anxiety in all study waves by migration status, weighted and imputed data in the fully adjusted model.

course of the pandemic, severity of mitigation strategies, as well as the different responsiveness of national social insurance systems and health care services, which might counteract and buffer potential declining mental health (Coronavirus – Social Security Responses, 2022).

In contrary to our hypotheses, in most countries we found no different time trends in symptoms of depression and anxiety between individuals with and without prior mental disorders during the observed periods, but in line with the findings of a current Dutch study, that reported no change of symptoms among individuals with depression, anxiety or obsessive-compulsive disorders (Pan et al., 2021). As everyone's life was restricted, a common feeling of "togetherness" might have alleviated potential feelings of social exclusion among vulnerable groups at least the early phase of the pandemic (Banulescu-Bogdan and Ahad, 2021). Likewise, a good responsiveness of social and health care services could have contributed to avoid the further worsening of mental health among individuals with prior mental illnesses. It is worth mentioning, that as our study population is selected toward a sample with higher education and middle-age women, these groups might have been less affected by adverse consequences of the pandemic and were more capable of seeking help if needed (Roberts et al., 2018) .Higher education is associated with better health literacy, but also with a generally better health, healthier lifestyle as well as better opportunities of working from home (van der Heide et al., 2013). Although, most cross-sectional studies found that young adults and elderly individuals seem to be the most affected by adverse mental health effects of the pandemic (Roberts et al., 2018). In Spain and Germany, we found some weak evidence that mental health changed differently over time in participants with and without mental illness, but we cannot rule out that the observed differences were due to chance as they could only be observed in one of the mental health measures.

Although related papers with data on repeated measurements of symptoms of depression and anxiety during several months of the pandemic are not available yet, we might compare – despite different outcome measures - our findings with a recently published study showing stable or even declining suicide rates in 21 countries (Pirkis et al., 2021). Similar to the conclusions in the study by Pirkis et al., we strongly recommend to continuously monitor mental health in the general population and particularly in vulnerable groups as deterioration of symptoms might emerge once the full consequences of socio-economic adversities unfold.

We did not find any consistent differences in symptoms of depression and anxiety over time in migrants and individuals born in the host population, with only minor differences observed in the Netherlands. This unexpected finding might arise from difficulties of including people with language problems and poor integration in the host society due to the sampling method. Moreover, potential differences are likely to be

minimized due to collapsing different groups of migrants from various countries in one group. Furthermore, in most countries this group was very small in our sample, which limited our ability to make valid inferences. More research is warranted with regard to conducting studies with large sample sizes including particularly groups from non-Western countries, refugees and asylum seekers to evaluate their mental health trajectories during the pandemic.

4.1. Strength and limitations

The major strength of our study included the repeated measures of common mental disorders during four waves in the first year of the COVID-19 pandemic based on a cohort of individuals, i.e. not cross-sectional data. Furthermore, we collected extensive information about the participants' psychosocial, living environment and health. Moreover, several different countries, affected by the pandemic in varying degrees at different time points and using discrepant mitigation strategies could be included.

One of the major limitations of this study is that the study population was drawn by convenience sampling which limits the generalizability of our findings. The majority of the participants were highly educated, middle-aged women who were self-selected into the study. Therefore, the results are mostly generalizable to this population, but to a lesser extent to more vulnerable populations which were difficult to reach with this study design. Another limitation of our study is the high rate of drop out between the repeated survey especially between the baseline and the first follow-up surveys. However, we used advanced statistical methodology to handle possible selective drop-outs during the follow-up periods, as individuals with worsening mental health are more prone to drop out from studies (Farmer et al., 1988; Lamers et al., 2012).

Furthermore, there were no measures of symptoms of depression and anxiety before the pandemic. Therefore, we cannot compare trends of symptoms of depression and anxiety with the year prior to the pandemic and were not able to give inference as to what extend the pandemic was responsible for any changes of mental health in the population. Instead, our study provides evidence of the development of depression and anxiety symptoms during the pandemic including periods with lockdowns. There were countries with relative low proportions of migrants among the participants. This led to collapsing heterogeneous groups (i.e. different countries of birth and reasons for migration such as refugees, time spent in the host country) in one group of migrants, which in turn might have limited our possibility to detect meaningful associations between migrant status and symptoms of depression and anxiety. In order to focus on the effect of the pandemic, we selected high-income countries with in general comparable socio-economic situations as well as health care and social insurance structures. Further research is warranted to investigate the development of depression and anxiety symptoms during the pandemic in low- and middle-income countries.

5. Conclusions

Mental ill-health was worse during the pandemic among individuals with prior mental illness than those without, but we found no convincing evidence that mental health changes over time would differ by previous mental health status or migration status during the first year of the pandemic in this convenience sample. Continuous monitoring of mental health and particularly in vulnerable groups is strongly recommended even in the months to come as deterioration of mental health symptoms might emerge once the full consequences of socio-economic adversities unfold.

CRediT authorship contribution statement

Concept and design: EMR, KG, JB.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: EMR, KG
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: JB, KG

Role of the funding source

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Conflict of Interest

There is no conflict of interest to report.

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Appendix A. Supplementary data

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