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Short communication

A one-year longitudinal study on suicidal ideation, depression and anxiety during the COVID-19 pandemic

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ABSTRACT

This longitudinal study aimed to examine the within-person changes in suicidal ideation, depression, and anxiety between the first wave of COVID-19 pandemic and the third wave (*i.e.*, one year later), while nationwide lockdowns were in effect. Among 720 respondents, 4.72% presented suicidal ideation, which appeared unaltered one-year post-pandemic onset, while both depression (21.25% *versus* 28.06%) and anxiety (12.08% *versus* 18.47%) increased significantly, adjusting for gender, age, and mental health history. Suicidal ideation, depression, and anxiety during the third pandemic wave were independently associated with crucial socio-demographic, clinical, psychological and psychopathological variables, in the stepwise regression analyses performed.

1. Introduction

Since the onset of the COVID-19 pandemic, there has been a widespread concern regarding its consequences on mental health (Byrne et al., 2021). Fear of COVID-19 infection coupled with indirect effects of the pandemic, such as social isolation economic instability, uncertainty, unemployment and barriers to access health services have been considered to exert a negative influence on public mental health (Tandon, 2021a).

However, a meta-analysis including longitudinal cohort studies that examined changes in mental health before as compared to during the pandemic in 2020, showed an overall small increase in mental health symptoms soon after the COVID-19 pandemic outbreak (during March-April) that declined over time and was comparable to pre-pandemic levels by mid-2020, among most population sub-groups (Robinson et al., 2021). More specifically, as regards suicidality, a meta-analysis, investigating suicide behaviors during the COVID-19 pandemic, demonstrated increased event rates for suicidal ideation, suicide attempts and self-harm when considered against the pre-pandemic studies' event rates (Dubé et al., 2021).

Of note, a longitudinal study of our research group investigating the psychological and social effects of the COVID-19 pandemic during the first pandemic wave in Greece, while a nationwide lockdown was in effect (April 7 to May 3, 2020) indicated a 5.20% prevalence of suicidal ideation, 14.17% of anxiety, and 26.51% of depression (Papadopoulou et al., 2021). During the second nationwide lockdown (November 22 to December 21, 2020) withing-person differences were investigated, and a significant increase emerged only in anxiety rates between the two periods, controlling for gender and age (Efstathiou et al., 2021).

With the COVID-19 pandemic still ongoing, it remains crucial to examine the course of its psychosocial consequences in the community, through the use of longitudinal studies, that explore within-individual changes over time and thus may provide unique insights, as the pandemic unfolds. The aim of this longitudinal study was to examine the

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within-person changes in suicidal ideation, depression and anxiety, from the first wave of COVID-19 pandemic to the third wave (*i.e.*, one year after the COVID-19 pandemic onset), while nationwide lockdowns were in effect as well, and to examine correlates of the aforementioned mental health variables.

2. Methods

2.1. Participants and process

A detailed description of our study's methods is included in a previous report (Papadopoulou et al., 2021). During the first COVID-19 wave and while the first national pandemic-related lockdown was imposed (April 7 to May 3, 2020) 5116 adults took part in an online survey with a view to assessing the social and psychological impact of COVID-19 pandemic.

Almost one year later, during the third wave of the pandemic while a third national lockdown was in effect (March 26 to May 3, 2021), we invited 1380 participants from the first survey, who had provided us with their emails for a follow-up survey, to respond to the same questions. From these 1380, a total of 720 adults (mean age 45.09 ± 12.16; 73.8% women; 59.9% married; 76.4% tertiary education) fully completed the questionnaire. The majority [515 (71.5%] were employed, with almost half of them [249 (48.5%)] reporting that they were tele-working, while 52 (7.2%) were unemployed, with 11 of them (21.2%) stating that they were unemployed due to COVID-19 pandemic.

2.2. Measures

Respondents completed a questionnaire developed for the study's purposes, as well as a number of psychometric instruments: (i) Generalized Anxiety Disorder [GAD-2; (Kroenke et al., 2007; Spitzer et al., 2006)] for the assessment of anxiety symptoms, (ii) Patient Health Questionnaire [PHQ-2 along with PHQ item 9; (Kroenke et al., 2003)] for the assessment of depression symptoms and suicidal ideation, respectively, (iii) Systemic Clinical Outcome and Routine Evaluation [(SCORE-15; (Stratton et al., 2010)] for family functioning assessment and iv) Connor-Davidson Resilience Scale [CD-RISC-2; (Vaishnavi et al., 2007)] for resilience evaluation.

A total score of equal or above '3′ in GAD-2 or PHQ-2 was used in order to identify participants with probable anxiety or depression, respectively, while a score of equal or above '1′ in PHQ-9 item 9 ("Thoughts that you would be better off dead, or of hurting yourself") was considered indicative of suicidal ideation.

2.3. Statistical analysis

Within-individual changes from the first wave/lockdown to the third wave/lockdown (*i.e* one year later) among the 720 individuals who completed both surveys were investigated using McNemar tests, while in order to adjust for gender, age, and mental health history, Generalized Estimating Equations (GEE) analyses were also applied. Among participants who were identified as 'suicidal ideation', 'depression' or 'anxiety' potential cases in both time points, Wilcoxon matched-pairs signed-rank tests and paired *t*-tests were used to examine probable within-person changes in the severity of their symptoms.

Multiple stepwise logistic regression analyses were used to evaluate socio-demographic, clinical, psychological and psychopathological correlates of (i) suicidal ideation, (ii) depression and (iii) anxiety potential cases during the third wave/lockdown, controlling for gender, age and mental health history. It is noted that regarding suicidal ideation a penalized logistic regression analysis, with Firth's correction to reduce small-sample size bias was used (Heinze and Schemper, 2002).

3. Results

Within-person changes over the course of the pandemic, and specifically from the first to the third wave/lockdown (*i.e.*, one year after the COVID-19 pandemic onset) among the 720 individuals were investigated. As regards suicidal ideation cases, no alterations emerged as the participants displayed a 4.72% (n = 34) suicidal ideation during the third wave/lockdown, which did not differ compared to the 4.72% that was noted during the first wave/lockdown (n = 34; unadjusted $p > 0.99$; adjusted for gender, age, and mental health history Odds Ratio (OR):1.03, 95%C.I.:0.72–1.49, $p = 0.864$).

In contrast, a significant proportion change emerged with regard to depression. Specifically, 28.06% (n = 202) of the participants in the third wave/lockdown' survey were identified as probable depression cases compared to 21.25% (n = 153) of the first wave/lockdown (unadjusted $p < 0.001$; adjusted for gender, age and mental health history OR:1.44, 95%C.I.:1.18–1.77, $p < 0.001$).

Similarly, a significant increase was found in anxiety, as 18.47% (n = 133) of the third wave/lockdown participants were identified as probable anxiety cases in comparison to 12.08% (n = 87) of the first wave/lockdown (unadjusted $p < 0.001$; adjusted for gender, age and mental health history OR:1.69, 95% C.I.:1.32–2.18, $p < 0.001$).

Within-person changes in the severity of symptoms among those respondents who displayed suicidal ideation (n = 17), depression (n = 86) and anxiety (n = 47) in both time points were investigated, but no statistically significant differences were found.

The results of the multiple logistic regression analyses are presented in Table 1. As regards suicidal ideation correlates, it emerged that depression, impaired family functioning, mental health history and suicidal ideation during the first wave/lockdown were independently related with higher suicidal ideation odds, whereas an older age, higher resilience, and the use of personal skills perceived as coping strategy during the pandemic were associated with lower odds.

Of note, quality of sleep after COVID-19 outbreak and suicidal ideation emerged as independent risk factors for both depression and anxiety, while being identified as a probable case of depression or anxiety, respectively, during the first survey also associated with higher odds one year later (Table 1).

4. Discussion

This longitudinal study investigated the within-person changes in suicidal ideation, depression, and anxiety between the first wave of the COVID-19 pandemic and the third wave, while nationwide lockdowns were in effect.

Among 720 individuals that participated in the study, 4.72% displayed suicidal ideation, which appeared unaltered one-year post-pandemic onset. Suicidal ideation during the first wave/lockdown, depression, impaired family functioning and mental health history emerged as independent risk factors for suicidal ideation, whereas an older age, resilience, and personal skills perceived as a coping strategy during COVID-19 pandemic as protective factors. Data regarding the trajectory of suicidal ideation over the course of the pandemic are rather limited, however a longitudinal Australian study assessing suicidal ideation from late-March to June 2020 and in March 2021, also showed that suicidal ideation remained stable, although a higher prevalence was recorded (approximately 18% across the acute lockdown phase of the pandemic in 2020, and 16.2% in March 2021) (Batterham et al., 2022). Furthermore, the absence of an increase in suicidal ideation is in line with the findings regarding overall suicide rates that, despite initial alarmist predictions, also appear stable over the course of the pandemic (Tandon, 2021b). However, the longer-term impact of the pandemic on suicidal ideation remains a concern: the increase of depression and anxiety in our study, both of them linked with suicidality in conjunction with the well-recognized impact of economic hardship needs further investigation (World Health Organization, 2022). Crucially, as noted

Table 1
Multiple stepwise logistic regression analyses for suicidal ideation, depression and anxiety in a community sample during the third COVID-19 pandemic wave / lockdown in Greece.

Variables	Odds Ratio	95% CI	*p*
Dependent: Suicidal ideation[a]			
Suicidal ideation during first lockdown, Yes *vs*. No	20.16	6.58 – 61.86	< 0.001
Depression, Potential case *vs*. Non-case	14.28	3.88 – 52.49	< 0.001
Impaired family functioning, Yes *vs*. No	4.55	1.74 – 11.90	0.002
Resilience (per unit)	0.64	0.48 – 0.85	0.002
Personal skills as a coping strategy during COVID-19 pandemic, Yes *vs*. No	0.33	0.13 – 0.88	0.026
Mental health history, Yes *vs*. No	3.95	1.30 – 11.96	0.015
Age (per year)	0.96	0.93 – 0.99	0.029
Gender[b], Women *vs*. Men	0.81	0.25 – 2.57	0.718
Dependent: Depression	**Odds Ratio**	**95% CI**	***p***
Depression during first lockdown, Potential case *vs*. Non-case	3.45	2.18 – 5.45	< 0.001
Suicidal ideation, Yes *vs*. No	5.21	1.61 – 16.88	0.006
Anxiety, Potential case *vs*. Non-case	7.22	4.36 – 11.95	< 0.001
Sleep quality after COVID-19 outbreak, Worsened/somewhat worsened *vs*. Remained the same	2.20	1.45 – 3.34	< 0.001
Sleep quality after COVID-19 outbreak, Improved/somewhat improved *vs*. Remained the same	1.83	0.86 – 3.89	0.119
Relationships with friends as a coping strategy during COVID-19 pandemic, Yes *vs*. No	0.57	0.383 – 0.86	0.007
Positive feelings towards the lockdown measures, Yes *vs*. No	0.44	0.27 – 0.72	0.001
Mental health history, Yes *vs*. No	0.67	0.35 – 1.28	0.225
Age (per year)	1.01	0.99 – 1.02	0.514
Gender[b], Women *vs*. Men	1.82	1.11 – 2.97	0.017
Dependent: Anxiety	**Odds Ratio**	**95% CI**	***p***
Anxiety during first lockdown, Potential case *vs*. Non-case	2.77	1.50 – 5.12	0.001
Depression, Potential case *vs*. Non-case	6.88	4.19 – 11.29	< 0.001
Suicidal ideation, Yes *vs*. No	3.22	1.18 – 8.82	0.023
Sleep quality after COVID-19 outbreak, Worsened/somewhat worsened *vs*. Remained the same	1.89	1.14 – 3.11	0.013
Sleep quality after COVID-19 outbreak, Improved/somewhat improved *vs*. Remained the same	0.43	0.12 – 1.52	0.189
Resilience (per unit)	0.75	0.64 – 0.88	< 0.001
Mental health history, Yes *vs*. No	1.72	0.88 – 3.38	0.116
Age (per year)	0.96	0.94 – 0.98	< 0.001
Gender[b], Women *vs*. Men	1.37	0.74 – 2.55	0.314

Notes: 95% CI: 95% Confidence Interval.
[a] Stepwise Firth's penalized logistic regression analysis.
[b] Concerning gender, as only 2 adults responded "other", they were not included in the analyses.

above, a statistically significant increase was observed in both depression (from 21.25% to 28.06%) and anxiety (from 12.08% to 18.47%) between the first and third lockdown. At this point the findings of our study are in the same vein with a recent WHO review which suggests a worldwide increase in mental health problems, depression and anxiety included (World Health Organization, 2022). In contrast, a previous European longitudinal study evaluating depression and anxiety also using PHQ-2 and GAD-2, respectively, found that there was a slight trend of decreasing prevalence rates in both probable depression (from 26.6% to 23.8%) and anxiety (from 17.7% to 16.7%) from November 2020 to April 2021, albeit there were significant differences between the included countries (Hajek et al., 2022).

To conclude, even though suicidal ideation prevalence remained stable one year after COVID-19 pandemic onset (*i.e.*, from the first to the third lockdown) the increase of anxiety and particularly depression rather disconcerting given the large amount of people with mental health problems who do not receive treatment and the problems of outpatient mental health services to offer appropriate treatment in the context of COVID-19 pandemic.

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Conflict of Interest

Authors have no conflicts of interest to declare.

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