Retrospective Study

Psychiatric hospitalization during the two SARS-CoV-2 pandemic waves: New warnings for acute psychotic episodes and suicidal behaviors

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Author contributions: Panariello F analyzed the data, managed the literature searches and analyses, and wrote the first draft of the manuscript; Fabio P, Longobardi S, and Cellini L wrote the protocol and collected the data; De Ronchi D designed the study and amended the last draft of the manuscript; Atti AR designed the study, improved the first draft of the manuscript, and conducted the statistical analyses; All authors managed the literature searches and helped Panariello F write the manuscript and approved the final manuscript.

Institutional review board statement: This study has been conducted in agreement with our Institutional Guidelines.

Informed consent statement: The informed consent statement was waived.

Conflict-of-interest statement: All authors declare that they have no

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Abstract

BACKGROUND

The subsequent waves of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic have represented a dramatic health emergency characterized by significant consequences on mental health. Diachronic variations in the incidence rates of acute relapse of psychiatric disorders may represent significant "sentinel events" for assessing the mental health response to an unprecedented stressful event.

AIM

To investigate the variation in psychiatric hospitalization rates and differences in sociodemographic and clinical-psychopathological peculiarities at Bologna "Maggiore" General Hospital Psychiatric Ward (GHPW) between the first two waves SARS-CoV-2 pandemic and the same periods of the previous 3 years. The secondary purpose of the study was to suggest a diachronic response pathway to stress by reporting additional literature data on coping strategies.

METHODS

This observational and retrospective study collected information on admission to the GHPW at the "Maggiore" Hospital in Bologna in the index periods defined as follows: the first period between February 24, 2020 and April 30, 2020 (first epidemic wave) and the second period between October 8, 2020, and January 7, 2021 (second pandemic wave). Absolute numbers and proportion of admitted patients, their sociodemographic and clinical-psychopathological characteristics were compared with the same parameters recorded in the two same periods of the previous 3 years. No strict inclusion or exclusion criteria were provided in the data collection to collect information on all patients requiring acute psychiatric

hospitalization.

RESULTS
During the first wave, there was a significant reduction in hospitalization rates, although there was a simultaneous increase in compulsory hospitalizations and the acute relapse of schizophrenia spectrum and other psychotic disorders. During the second wave, hospitalization rates reached those recorded during the same period of the previous 3 years, mainly due to the rise of bipolar and related disorders, depressive disorders, anxiety disorders, trauma- and stressor-related disorders and suicidal behaviors.

CONCLUSION
The coping strategies adopted during the first wave of the SARS-CoV-2 pandemic protected the vulnerable population from the general risk of clinical-psychopatho-logical acute relapse, even if they increased the susceptibility to run into schizo-phrenia spectrum and other psychotic disorder relapses. In the medium-long term (as in the second pandemic wave), the same strategies do not play protective roles against the stress associated with the pandemic and social restriction measures. Indeed, during the second wave of the SARS-CoV-2 pandemic, an increase in total hospitalization rate, suicidal behaviors and the incidence rate of bipolar and related disorders, depressive disorders, anxiety disorders, trauma- and stressor-related disorders was observed.

Key Words: SARS-CoV-2; Schizophrenia spectrum and other psychotic disorders; Bipolar and related disorders; Depressive disorders; Anxiety disorders, trauma- and stressor-related disorders; Suicide behavior; Coping strategies

Core Tip: The severe acute respiratory syndrome coronavirus 2 emergency has impacted global health. This study describes psychiatric hospitalization rates and clinical characteristics during changes in the first two epidemic waves compared to the respective periods of the previous 3 years. Although the hospitalization rate decreased during the first pandemic wave, compulsory hospitalizations have increased. During the second pandemic wave, hospitalization rates returned to those recorded in the same period of the previous 3 years. Acute relapse in psychotic disorders increased during the first epidemic wave, but acute relapse in affective and anxiety disorders have increased in the second epidemic wave as well as suicidal behavior.

INTRODUCTION

In Italy, the first epidemic outbreak occurred at the end of February 2020 in Lombardy [1]. The Italian government adopted several social distancing measures and limitations of social recreational and work activities at national and regional levels to contain infection spread. These measures progressively increased until the lockdown imposed by the Prime Minister's Decree of Ministers of March 9, 2020. Similarly, from the first decade of October 2020, in order to contain the spread of the second pandemic wave, the Italian Prime Minister issued another set of social distancing measures up to a level of limitation similar to the first lockdown. Details on social distancing measures during the first and second waves in Italy are reported in Table 1.

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-related pandemic threatened the health of citizens and significantly contributed to a widespread sense of insecurity and a lessened quality of life for both individuals and

Table 1 First and second pandemic waves and social distancing measures	
First wave (February 24, 2020 to April 30, 2020), 66 d	**Second wave (October 8, 2020 to January 7, 2021), 92 d**
Main governative measures	**Main governative measures**
Smart working (more than 50%)	Smart working (8%-40%)
Distance learning (more than 75%)	Distance learning (75%-100%)
In and outdoor mask wearing (always)	In and outdoor mask wearing
Leisure activities limitations	Leisure activities limitations
Relatives and friends restricted visiting	Relatives and friends restricted visiting
Travelling limitations	Travelling limitations
Cinemas, theaters, museums, betting halls closure	Cinemas, theaters, museums, betting halls closure
Bars and restaurants closure from total closure to closure from 6.00 pm (prohibited on-site consummation)	Bars and restaurant closure from 6.00 pm (prohibited on-site consummation)
Night curfew (from 8:00 pm)	Night curfew (from 9:00 pm)

entire communities[2]. Such psychosocial effects on individuals (*e.g.,* insecurity, fear, uncertainty, confusion, isolation, and stigma) and the whole community (*e.g.,* school and workplace closures, the shutdown of social gathering places, suspension of economic activities, and uncertainty in health claims) may have contributed to threatening the mental health of individuals and the collective[3,4] and causing both new onsets of clinical pictures from adjustment disorders and relapses of psychiatric disorders from severe mental illness (SMI)[5-7]. These consequences have already been reported in the general population[8,9], vulnerable individuals[7,10], and patients with a history of psychiatric disorders[11]. Furthermore, the long-term consequences on mental health are likely to continue even after the end of the pandemic emergency, resulting, for example, from the economic burden due to the adopted social distancing measures. In epidemiological terms, it could be worse than the consequences on the mental health during the economic crisis in Italy and Greece in 2008, where a significant increase of suicidal behaviors and suicide occurred, as was well described in the literature[12,13].

The Italian mental health system is extensively community-based, and mental health care is freely available to all citizens. Besides outpatient settings, in Italy, there are nearly 318 psychiatric wards located within the general hospitals (General Hospital Psychiatric Wards [GHPWs]). Each ward contains, on average, 15 beds dedicated to treating psychiatric patients in both voluntary and compulsory ways[14]. The total national number of beds to take care of acute psychiatric clinical pictures is 3981, which means around 10 beds *per* 100000 adult population[14]. Therefore, GHPWs are places of care dedicated to the hospitalization and treatment of acute psychopathological relapses that can be configured as psychiatric emergencies/urgencies. They represent a privileged observatory to survey the changes, in terms of incidence, of new-onset or acute relapse of clinical pictures related to SMIs such as those observed during the exposure to high-stress life events. For this reason, they play a crucial role during global crises that also involve mental health and represent a fundamental source of information to be collected in the early stages of a crisis, valuable both to better understand individual and collective coping strategies and to implement preventive actions and timely care[15-17].

Only a few studies[16,18] have examined and described qualitative and quantitative differences observed in the rates of urgent/emergent hospitalization within the psychiatric wards between the pre-pandemic and SARS-CoV-2 pandemic characterized by the consistent social restriction measures. Furthermore, to the best of our knowledge, no studies to date have investigated these differences during the first and second pandemic waves.

This study investigated the existence of any differences in terms of acute psychiatric relapse or new onset of psychiatric disorders observed at the GHPW of the "Maggiore" Hospital in Bologna between the first and second epidemic wave compared to the same periods of the previous 3 years by comparing the sociodemographic and clinical features.

To achieve this aim, we took into consideration: Voluntary hospitalization rates, compulsory hospitalization rates, diagnoses, and the severity of psychopathological-clinical pictures estimated by the mental health triage (MHTS)[19,20].

Furthermore, based on our results and the collection of scientific evidence that we have collected in the literature regarding the response of individuals and communities to stressful factors and their persistence over time, we propose an opinion review to depict a hypothetical model of the diachronic response of the community to unusually stressful and unprecedented events. We hypothesize that the coping strategies and their efficacy can change over time and, depending on the individual aptitude to answer to the stress, we have generated an "elastic" model that can give reason to the different psychopathological pictures observed over time, after and during a stressful event.

MATERIALS AND METHODS

Participants

This observational and retrospective study collected information on admissions to the GHPW at the "Maggiore" Hospital in Bologna in the index periods defined as follows: the first period between February 24, 2020 and April 30, 2020 (first epidemic wave) and the second period between October 8, 2020, and January 7, 2021 (second pandemic wave). Absolute numbers and the proportion of admitted patients, their sociodemographic and clinical-psychopathological characteristics were compared with the same parameters recorded in the two same periods of the previous 3 years. No strict inclusion or exclusion criteria were provided in the data collection to collect information on all patients requiring acute psychiatric hospitalization. This study followed the last version of the Declaration of Helsinki[21].

Assessment

For each patient hospitalized in the index periods, clinical data were collected, determining the diagnosis and the level of emergency/urgency at the time of admission based on the MHTS by the Victorian Emergency Department[19,20]. The MHTS is a triage scale aimed at identifying the severity level of psychopathological pictures to prioritize the intervention. It consists of a five-level scale: Level 1, the substantial danger of life to oneself and others; Level 2, violent, aggressive, probable danger of injury to oneself or others or with police escort; Level 3, very distressed or psychotic, liable to deteriorate, situational crisis, possible danger to oneself or others; Level 4, long-lasting semi-urgent mental health disorder, support agency present; and Level 5, long-standing non-acute mental health disorder, no support agency present. Patients were assessed using combined mental health and sociodemographic information.

Hospitalized patients were divided into emergent (Level 1 and 2) and urgent (Level 3, 4, and 5) cases. In the hospitalized population, the incidence rate of compulsory hospitalizations was calculated [according to the Italian law (Law number 180/1978), in case of acute psychopathological distress, when patients lack insight and refuse the treatments which they need, and there are no possibilities to provide outpatient treatments, psychiatric admissions against the patient's will are possible - compulsory admissions[22]. We also collected other data such as sociodemographic data (sex, age) and the length of hospitalization. Age was used as a continuous variable. Diagnoses were assessed according to the DSM 5 through the administration of the Structured Clinical Interview for the DSM 5 Clinician Version (SCID-5-CV). The SCID-5-CV is characterized by excellent reliability and high specificity, and there is evidence for its easy use in daily clinical practice[23].

Statistical analyses

Continuous data for sociodemographic and clinical variables are expressed as the mean ± SD, while categorical variables are reported as percentages. The Kolmogorov-Smirnuov test was performed to verify normal distributions of continuous variables. Multiple logistic regression analyses were performed by including variables that were significant for bivariate analysis. Pearson's chi-squared test with Yates correction or the *t*-test for independent samples was used to compare categorical and continuous variables, respectively, between the identified subgroups. As the dependent variable, we used GHPW hospitalization during the pandemic. Odds ratio (OR) and 95% confidence interval (95%CI) were calculated to estimate the correlation between the frequencies of the hospitalization and the frequencies of independent variables. All statistical analyses were performed using the SPSS package (version 27.0, SPSS; SPSS Inc., Chicago, IL, United States) for Windows, and $P < 0.05$ (two-tailed) was considered statistically significant.

RESULTS

During the first index period, we observed 47 inpatients at GHPW "Maggiore" Hospital in Bologna (84 hospitalized patients during the second index period); 42.58% of the hospitalized population was female (*vs* 43.2% during the second lockdown). The mean age was 42 + 2 (years + SD) during the first index period (*vs* 43.9 + 1 during the second index period). The length of hospitalization was 8.8 + 3 d in the first index period and 8.5 + 2 d in the second index period. According to MHTS, 85.7% of the admitted patients were classified as urgency during the first index period (80.7% during the second index period). No differences were observed between the two pandemic waves and the same periods of the previous 3 years in length of hospitalization, mean age, and sex.

A reduction in total psychiatric hospitalization number during the first lockdown of 33.49% compared to the hospitalization rate in the same period of the previous 3 years was reported (47 in 2020 *vs* 81 in 2019, 68 in 2018, and 63 in 2017 for further details; Table 2). On the other hand, an increase in compulsory admissions was observed: 19.7% of total admissions that occurred during the first lockdown compared to 10.1% ($P < 0.01$) in the same period of 2019, 13.3% ($P < 0.05$) in 2018, and 7.2% in 2017 ($P < 0.01$). Consistently with these features, hospitalized patients presented a higher degree of psychopathological emergency at MHTS than in the same period of the previous 3 years (28.2% *vs* 13.6% [$P < 0.01$] in 2019, 25% [$P < 0.05$] in 2018, and 14.3% in 2017 [$P < 0.01$]) (Table 2).

During the first pandemic wave and related restriction measures, schizophrenia spectrum and other psychotic disorders diagnoses increased by 10% on average. As indicated in Table 2, 39.5% in 2020 *vs* 32.1% in 2019 ($P < 0.05$), 31.5% in 2018 ($P < 0.05$), 25.1% in 2017 ($P < 0.01$). Anxiety disorders and trauma- and stressor-related disorders (Group C in Table 2) showed an increasing trend during the first lockdown (8% in 2020 *vs* 5.2% in 2019, 5.9% in 2018, and 5.8% in 2017). Logistic regression analyses considering hospitalization at GHPW during the first pandemic wave and the estimated probability ratio (OR) was as follows: Male/female (OR = 1.754; $P < 0.001$), self-harm behavior (OR = 2.066; $P < 0.001$) as an independent variable (Table 3). During the second wave, hospitalization numbers increased reaching the same rate recorded during the previous 3 years (84 *vs* 89 in 2019, 85 in 2018, 88 in 2017) while the proportion of compulsory admissions and the level of emergency, according to the MHT, decreased to the percentages observed in the same period of the previous 3 years (Table 4).

Bipolar and related disorders, depressive disorders, anxiety disorders, and trauma- and stressor-related disorders according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM5) were those that were statistically increased significantly during the second pandemic wave compared to the same period of the three previous years. Bipolar and related disorders and depressive disorders were 32.9% of total hospitalizations *vs* 28.8% ($P < 0.01$) in 2019, 29.4% ($P < 0.05$) in 2018, 30.1% ($P < 0.05$) in 2017, in the same period of the previous 3 years. The disorders belonging to anxiety disorders and trauma- and stressor-related disorders according to the DSM5 during the second pandemic wave and related restrictive measures were 9% of total hospitalizations *vs* 4.2% ($P < 0.01$) in 2019, 3.7% ($P < 0.01$) in 2018 and 2.1% ($P < 0.01$) in 2017. We also observed a statistically significant increase in suicidal behavior during the second pandemic wave compared with the average recorded during the same period of the previous 3 years (20.22% *vs* 11.10%; $P < 0.01$). Disorders belonging to the schizophrenia spectrum were more prevalent in the second pandemic wave (10.4%) than in the same period of the previous 3 years, albeit not statistically significant. Logistic regression analyses considering hospitalization at GHPW during the second pandemic wave and the estimated probability ratio (OR) as an independent variable was as follows: male/female (OR = 1.938; $P < 0.001$) and suicidal behavior (OR = 2.410; $P < 0.001$) (Table 5).

DISCUSSION

Our results showed that, in patients with mild and moderate mental illness, during the first wave and the adoption of the first set of measures to contain the pandemic spread, some protective factors seemed to balance and outweigh the risky ones related to the pandemic and quarantine. The total number of hospitalizations at the GHPW decreased with a relative increase in the pictures listed as a psychiatric emergency according to the MHT (codes 1 + 2). On the other hand, the acute relapse of acute

Table 2 Absolute numbers of total admissions, proportion of emergencies, urgencies and compulsory admissions occurred during the first pandemic wave and in the same period of previous 3 years

Yr	Total admissions	Urgencies	Emergencies (*P* value *vs* 2020)	Compulsory admissions (*P* value *vs* 2020)	Schizophrenia spectrum disorders (*P* value *vs* 2020)	Mood disorders (*P* value *vs* 2020)	Anxiety disorders (*P* value *vs* 2020)
2017	63	85.7%	14.3% (< 0.01)	7.2% (< 0.01)	25.1% (< 0.01)	28.2% (> 0.05)	5.8% (> 0.05)
2018	68	75.0 %	25% (< 0.05)	13.3% (< 0.05)	31.5% (< 0.05)	28.0% (> 0.05)	5.9% (> 0.05)
2019	81	86.4%	13.6% (< 0.01)	10.1% (< 0.05)	32.1% (< 0.05)	27.9% (> 0.05)	5.2% (> 0.05)
2020	47	71.8%	28.2%	19.7%	39.5%	28.6%	8.0%

Emergencies defined for codes 1 + 2, Urgencies defined for codes 3 + 4 + 5 at Mental health Triage. Diagnosis DSM-5 295.9-295.40-295.70-297.1-297.3-298.8-298.9: Schizophrenia Spectrum and Other Psychotic Disorders. Diagnosis DSM-5 296.2-296.3-296.9-311-296.XX: Bipolar and Related Disorders and Depressive Disorders. Diagnosis DSM-5 309.81-308.3-309.0-309.24-309.28-309.3-309.4-309.9-309.89: Anxiety Disorders and Trauma- and Stressor-Related Disorders.

Table 3 Multivariate logistic regression analyses: odds ratio, and 95% confidence interval for hospitalization during the first pandemic wave

Characteristic	*P* value	OR	95%CI for EXP
Male/female	< 0.001	1.754	1.331–2.312
Self-harm behaviour	< 0.001	2.066	1.477–2.890

CI: Confidence interval; OR: Odds ratio.

Table 4 Absolute numbers of total admissions, proportion of urgencies, emergencies and compulsory admissions occurred during the second pandemic wave and in the same period of the previous 3 yr

Yr	Total admissions	Urgencies	Emergencies (*P* value *vs* 2020/2021)	Compulsory admissions (*P* value *vs* 2020/2021)	Psychotic spectrum disorders (*P* value *vs* 2020/2021)	Affective spectrum disorders (*P* value *vs* 2020/2021)	Anxiety spectrum disorders (*P* value *vs* 2020/2021)
2017	88	80.7%	19.3% (> 0.05)	9.1% (> 0.05)	35.9% (> 0.05)	30.1% (< 0.05)	4.1% (< 0.01)
2018	85	81.2 %	18.8% (> 0.05)	10.7% (> 0.05)	35.6% (> 0.05)	29.4% (< 0.05)	3.7% (< 0.01)
2019	89	81.5%	18.5% (> 0.05)	9.9% (> 0.05)	33.7% (> 0.05)	28.8% (< 0.01)	4.2% (< 0.01)
2020/2021	84	80.7%	19.3%	10.4%	36.1%	32.9%	9.0%

Emergencies defined for codes 1 + 2, Urgencies defined for codes 3 + 4 + 5 at Mental health Triage. Diagnosis DSM-5 295.9-295.40-295.70-297.1-297.3-298.8-298.9: Schizophrenia Spectrum and Other Psychotic Disorders. Diagnosis DSM-5 296.2-296.3-296.9-311-296.XX: Bipolar and Related Disorders and Depressive Disorders. Diagnosis DSM-5 309.81-308.3-309.0-309.24-309.28-309.3-309.4-309.9-309.89: Anxiety Disorders and Trauma- and Stressor-Related Disorders

psychiatric clinical pictures belonging to schizophrenic spectrum disorders has undergone a statistically significant increase during the first pandemic wave and the first social restriction measures. In the literature, other authors have already described the increase in incidence rates of psychotic clinical pictures, and this phenomenon may probably have a generalizable value in all the countries most severely affected by the SARS-CoV-2-related pandemic and which have been subject to measures to contain the spread of the virus[24-26]. These preliminary data were consistent with results from other countries, such as China, where the pandemic would have originated and where the highest incidence of the first psychotic episode was reported in the months following the origin of the pandemic[27].

Table 5 Multivariate logistic regression analyses: odds ratio, and 95% confidence interval for hospitalization during the first pandemic wave

Characteristic	*P* value	OR	95%CI for EXP
Male/female	< 0.001	1.938	1.357–2.766
Self-harm behaviour	< 0.001	2.410	1.731–3.354

CI: Confidence interval; OR: Odds ratio.

It can be argued that the highly stressful scenario deriving from the fear of contagion, the confinement and the reduction of freedom imposed by the restrictive measures, the fear of the future evolution of the pandemic situation, the fear of the potential economic crisis could have played a significant role in the new-onset and the exacerbation of pathologies belonging to the schizophrenia spectrum according to international literature.

Although the relationship between the pressure exerted by highly stressful events during adult life and the onset of psychosis has been poorly studied, the results of a large meta-analysis suggest that the risk of psychosis onset is three times higher in subjects exposed to highly stressful events[28].

The data relating to the increase in the onset of new psychoses recorded in our data collection during the first pandemic wave was consistent with Pollice *et al*[29] in 2012. They observed the same boost in first psychosis episodes in connection with the earthquake in L'Aquila in 2009, an event whose traumatic extent can be compared, in some ways, to the traumatic impact of the related SARS-CoV-2 pandemic and to the consequent deterioration of social life and which share the same cultural scenario (both the stress events and the related results happened in Italy)[29].

We hypothesized that the coping strategy could be called into question to understand better the phenomenon from a psychological point of view in the biopsychosocial perspective.

Coping is identified as a complex of strategies adopted to manage stress better and reduce the emotional impact of stress events. They have been described as emotion-focused coping strategies, problem-oriented coping strategies and avoidance-focused coping strategies. Problem-focused coping strategies are termed "positive coping" as they relate to better outcomes[30]. Patients with more severe symptoms of schizophrenia are characterized by a reduced use of positive coping strategies[30]. Furthermore, the severity of psychotic symptoms is inversely related to positive coping, which is related to better functional outcomes[31,32]. Overall, results from the scientific literature suggest that schizophrenic patients rely on maladaptive coping strategies or have the potential to exacerbate distress.

The observation, already reported, of a global decline in the number of hospitalizations at "Maggiore" Bologna Hospital's GHPW also may be analyzed considering the theory of coping strategies. If several social factors such as the shared experience at the national level of a sense of cohesion, trust and social compassion perceived by the whole nation and the increase of the importance of informal social networks, it can also be argued that most individuals have adopted positive coping strategies. It could mean that individuals with a higher vulnerability to psychotic disorders cannot adopt on their own problem-oriented coping strategies. From the biological point of view of the biopsychosocial model of psychiatric disorders, it can be speculated that severe psychiatric pictures, including schizophrenia, bipolar disorders, and depressive disorders for which a greater etiological weight is recognized to the biological factor in the biopsychosocial model, could have been triggered by the direct neuroinvasiveness of SARS-CoV-2 or by the consequences of consequences of peripheral infection or by the subsequent inflammatory state on the central nervous system (CNS). Our group proposed a generating hypothesis that SARS-CoV-2 would demonstrate a neuroinvasive and neurotropic capacity through different anatomical pathways[33] through the angiotensin-converting enzyme-2 receptor. Possible speculation regarding the observed data is that SARS-CoV-2, through the colonization of the CNS, may act as an etiological cofactor in the exacerbation or in the onset of psychopathological pictures that recognize a more significant causal load of the biological component in the biopsychosocial model.

Further evidence of the present study suggests that in the medium to long term, such as during the adoption of restrictive measures in the second pandemic wave, there was an overall increase in the incidence of acute psychopathological relapse.

Indeed, the hospitalization rate reverted to the pre-existing incidence recorded in the same periods of the previous 3 years. This feature was mainly due to the rise of Mood (bipolar and related disorders and depressive disorders) and anxiety disorders. This result suggests that positive coping strategies, in the case of the ongoing pandemic, have proven to be effective in the short-term prevention of acute mood and anxiety disorders but have lost this in the long term. Other notable data is the increase in the suicidal behavior rate. This finding can be, in part, explained considering the increase of depressive disorders incidence.

On the other hand, the impact of the stress on suicidal behavior can also be considered. Indeed, as highlighted by Monica Starkman, in a brief report on the suicide attempt rate after the terrorist attack in September 11, 2001, the stress related to that unprecedented attack contributed to the statistically significant increase in the number of suicidal behaviors during the 2 years following the September 11, 2001[34]. Furthermore, in our study, suicidal behaviors are also strong predictors of psychiatric hospitalization during the second pandemic wave at multiple regression analysis.

CONCLUSION

The findings in this study showed that the higher incidence of hospitalizations for mood disorders and suicidal behavior must also be evaluated considering the growing and looming economic crisis due to the restrictive policy measures influencing the indicators of social well-being. Deaths from suicidal behavior increase dramatically during economic crises. In 2016, as Merzagora *et al*[35], in Italy, suicides increased between 2011 and 2016, during and immediately after the severe economic crisis that began in 2008[35]. Our preliminary data highlight the requirement to adopt preventive social and health policies to contain a potential "psychopathological pandemic" following the SARS-CoV-2 pandemic and invite the scientific society to pay attention to the problem.

By combining our clinical observations with the epistemological theories present in the literature[36-38], we propose an opinion hypothesis based on applying, to the phenomenon of psychological stress and coping strategies, the same laws of physics as the law by Hooke. It states that, in a mechanical system, the elastic response to a force F applied to an object is proportional to the variation of variable length (ΔL) multiplied by a specific constant of the material of which the object is composed [F = ΔL·K]. In biological systems, as reported by Kültz and Somero[38], organisms represent homeostatic systems in continuous dynamic equilibrium. Stress is constantly fluctuating around the norm throughout the life history of any organism. This fluctuation can push psychological and physiological set points out of homeostasis H.

The extent of the deviation (increase or decrease in value) of the most critical (limiting) variables (ΔHc) from the homeostatic set point (Hc) determines the behavior of the system. Therefore, for biological systems, Hooke's law can be defined as [F = ΔHc·k], where k is a constant describing the phenotype of the biological system at the moment of exposure to force F and Hc represents the homeostatic norm H of most critical (limiting) physiological variables c. Our opinion is that this construct is also valid for psychological systems where homeostasis is ensured by multiple factors, including coping and stress response strategies. The challenge is to identify which biopsychological variables might be the most critical and limiting ones. These variables will depend on stress type and severity and the individual's state at the time of the stressful event. Within this theoretical hypothesis, the time factor would also play a key role. If a perturbing event acts for a time interval Δt, some psychological homeostatic set points could alter at different time points, depending on the "elastic capacity" of the same set points and the coping strategies adopted. In our case, the set point of the affective dimension would have "broken" later than that of the psychotic dimension.

Limits and perspectives of the study

The current study had several limitations. Meanwhile, it is a monocentric study and describes what happened in one of the Italian GHPWs. As such, it does not claim to draw ecumenical conclusions. Our data are consistent with what was described by other authors during the first pandemic wave. However, our study represents the first that follows diachronically, during the first and second pandemic waves, the trend of hospitalizations for acute psychiatric relapse in response to the Trauma of the pandemic and the consequent restrictive measures. The last "take-home messages" that deserve to be taken into consideration and on which to calibrate the subsequent

research trajectories are the following: The severe mental illnesses have not suffered, contrary to the moderate-mild mental disorders, a contraction in terms of acute relapse, during the first SARS-CoV-2 pandemic wave. The "advantage" of moderate/mild disorders is lost during the second pandemic because the protective factors probably no longer balance the precipitating factors. The findings from the first pandemic wave suggest that mild/moderate psychopathological clinical pictures can be successfully treated in settings other than GHPWs. This key point indicates that: It is possible to reduce hospitalization rates by enhancing and customizing the offers of the community mental health care settings; it is confirmed that traumatic experiences are important causal factors of psychotic relapse in the short-term period and mood disorders relapse in the long-term period; and the suicide risk could, with every reasonable probability, become the real post-pandemic emergency in light of the emerging and consequent economic-financial crisis.

ARTICLE HIGHLIGHTS

Research background
Significant consequences on mental health characterize unprecedented events like the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic. Therefore, variations in psychiatric hospitalization rates represent significant "sentinel events" for assessing the mental health response to stress. Responses to the stress may lead to new-onset or relapses of severe mental illness and suicidal behavior rates.

Research motivation
To reduce the further consequences on the mental health of the SARS-CoV-2 Pandemic by describing the repercussions of the first two waves of the pandemic on the psychiatric new-onset or relapse pictures rates.

Research objectives
The present study investigates any differences in terms of acute psychiatric relapse or new onset of psychiatric disorders observed at the General Hospital Psychiatric Ward (GHPW) at "Maggiore" Hospital in Bologna between the first and second epidemic.

Research methods
We took into consideration: Voluntary hospitalization rates, compulsory hospitalization rates, diagnoses, and the severity of psychopathological-clinical pictures estimated by the mental health triage and Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition interview. Multiple logistic regression analyses were performed to estimate the correlation between the frequencies of the hospitalization and the frequencies of the independent variables.

Research results
The total admissions rate at GHPW decreased during the first SARS-CoV-2 pandemic wave compared to the same period throughout the 3 previous years. The compulsory admission rate and acute psychotic relapse rate increased during the first SARS-CoV-2 pandemic wave in comparison with the 3 previous years. During the second SARS-CoV-2 pandemic wave the total psychiatric admission rate reached the same ratio recorded during the same period of the previous 3 years. Suicidal behaviors, depressive disorders, bipolar disorders, anxiety spectrum disorders and trauma- and stressor-related disorders relapse arose among hospitalized patients during the second SARS-CoV-2 pandemic wave compared with the 3 previous years.

Research conclusions
We hypothesize that problem-focused coping strategies may be protective for the risk of acute psychopathological relapse in the short term but not in the medium-long term.

Research perspectives
The suicidal rate could arise in the future, after the first two pandemic waves therefore may be important to survey it and to adopt preventive strategies.

REFERENCES

1 **Prezioso C**, Pietropaolo V. COVID-19: update of the Italian situation. *J Neurovirol* 2020; **26**: 834-837 [PMID: 32901393 DOI: 10.1007/s13365-020-00900-w]

2 **Solymosi R**, Jackson J, Pósch K, Yesberg JA, Bradford B, Kyprianides A. Functional and dysfunctional fear of COVID-19: a classification scheme. *Crime Sci* 2021; **10**: 4 [PMID: 33585156 DOI: 10.1186/s40163-020-00137-2]

3 **Mukhtar S**. Psychological health during the coronavirus disease 2019 pandemic outbreak. *Int J Soc Psychiatry* 2020; **66**: 512-516 [PMID: 32434402 DOI: 10.1177/0020764020925835]

4 **Hotopf M**, Bullmore E, O'Connor RC, Holmes EA. The scope of mental health research during the COVID-19 pandemic and its aftermath. *Br J Psychiatry* 2020; **217**: 540-542 [PMID: 32493516 DOI: 10.1192/bjp.2020.125]

5 **Vindegaard N**, Benros ME. COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. *Brain Behav Immun* 2020; **89**: 531-542 [PMID: 32485289 DOI: 10.1016/j.bbi.2020.05.048]

6 **Heitzman J**. Impact of COVID-19 pandemic on mental health. *Psychiatr Pol* 2020; **54**: 187-198 [PMID: 32772053 DOI: 10.12740/PP/120373]

7 **Singh S**, Roy D, Sinha K, Parveen S, Sharma G, Joshi G. Impact of COVID-19 and lockdown on mental health of children and adolescents: A narrative review with recommendations. *Psychiatry Res* 2020; **293**: 113429 [PMID: 32882598 DOI: 10.1016/j.psychres.2020.113429]

8 **Hossain MM**, Tasnim S, Sultana A, Faizah F, Mazumder H, Zou L, McKyer ELJ, Ahmed HU, Ma P. Epidemiology of mental health problems in COVID-19: a review. *F1000Res* 2020; **9**: 636 [PMID: 33093946 DOI: 10.12688/f1000research.24457.1]

9 **Xiong J**, Lipsitz O, Nasri F, Lui LMW, Gill H, Phan L, Chen-Li D, Iacobucci M, Ho R, Majeed A, McIntyre RS. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J Affect Disord* 2020; **277**: 55-64 [PMID: 32799105 DOI: 10.1016/j.jad.2020.08.001]

10 **Moreno C**, Wykes T, Galderisi S, Nordentoft M, Crossley N, Jones N, Cannon M, Correll CU, Byrne L, Carr S, Chen EYH, Gorwood P, Johnson S, Kärkkäinen H, Krystal JH, Lee J, Lieberman J, López-Jaramillo C, Männikkö M, Phillips MR, Uchida H, Vieta E, Vita A, Arango C. How mental health care should change as a consequence of the COVID-19 pandemic. *Lancet Psychiatry* 2020; **7**: 813-824 [PMID: 32682460 DOI: 10.1016/S2215-0366(20)30307-2]

11 **Yao H**, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry* 2020; **7**: e21 [PMID: 32199510 DOI: 10.1016/S2215-0366(20)30090-0]

12 **Alicandro G**, Malvezzi M, Gallus S, La Vecchia C, Negri E, Bertuccio P. Worldwide trends in suicide mortality from 1990 to 2015 with a focus on the global recession time frame. *Int J Public Health* 2019; **64**: 785-795 [PMID: 30847527 DOI: 10.1007/s00038-019-01219-y]

13 **Borrell C**, Palència L, Marí Dell'Olmo M, Morrisson J, Deboosere P, Gotsens M, Dzurova D, Costa C, Lustigova M, Burstrom B, Rodríguez-Sanz M, Bosakova L, Zengarini N, Katsouyanni K, Santana P. Socioeconomic inequalities in suicide mortality in European urban areas before and during the economic recession. *Eur J Public Health* 2020; **30**: 92-98 [PMID: 31410446 DOI: 10.1093/eurpub/ckz125]

14 **de Girolamo G**, Cerveri G, Clerici M, Monzani E, Spinogatti F, Starace F, Tura G, Vita A. Mental Health in the Coronavirus Disease 2019 Emergency-The Italian Response. *JAMA Psychiatry* 2020; **77**: 974-976 [PMID: 32352480 DOI: 10.1001/jamapsychiatry.2020.1276]

15 **Xiang YT**, Zhao YJ, Liu ZH, Li XH, Zhao N, Cheung T, Ng CH. The COVID-19 outbreak and psychiatric hospitals in China: managing challenges through mental health service reform. *Int J Biol Sci* 2020; **16**: 1741-1744 [PMID: 32226293 DOI: 10.7150/ijbs.45072]

16 **Clerici M**, Durbano F, Spinogatti F, Vita A, de Girolamo G, Micciolo R. Psychiatric hospitalization rates in Italy before and during COVID-19: did they change? *Ir J Psychol Med* 2020; **37**: 283-290 [PMID: 32368994 DOI: 10.1017/ipm.2020.29]

17 **Guo J**, Feng XL, Wang XH, van IJzendoorn MH. Coping with COVID-19: Exposure to COVID-19 and Negative Impact on Livelihood Predict Elevated Mental Health Problems in Chinese Adults. *Int J Environ Res Public Health* 2020; **17** [PMID: 32485859 DOI: 10.3390/ijerph17113857]

18 **Ambrosetti J**, Macheret L, Folliet A, Wullschleger A, Amerio A, Aguglia A, Serafini G, Prada P, Kaiser S, Bondolfi G, Sarasin F, Costanza A. Impact of the COVID-19 Pandemic on Psychiatric Admissions to a Large Swiss Emergency Department: An Observational Study. *Int J Environ Res Public Health* 2021; **18** [PMID: 33525740 DOI: 10.3390/ijerph18031174]

19 **Broadbent M**, Moxham L, Dwyer T. The development and use of mental health triage scales in Australia. *Int J Ment Health Nurs* 2007; **16**: 413-421 [PMID: 17995512 DOI: 10.1111/j.1447-0349.2007.00496.x]

20 **Smart D**, Pollard C, Walpole B. Mental health triage in emergency medicine. *Aust N Z J Psychiatry* 1999; **33**: 57-66; discussion 67 [PMID: 10197886 DOI: 10.1046/j.1440-1614.1999.00515.x]

21 **World Medical Association**. . World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA* 2013; **310**: 2191-2194 [PMID: 24141714 DOI: 10.1001/jama.2013.281053]

22 **Barbui C**, Papola D, Saraceno B. Forty years without mental hospitals in Italy. *Int J Ment Health Syst* 2018; **12**: 43 [PMID: 30079100 DOI: 10.1186/s13033-018-0223-1]

23 **Osório FL**, Loureiro SR, Hallak JEC, Machado-de-Sousa JP, Ushirohira JM, Baes CVW, Apolinario

TD, Donadon MF, Bolsoni LM, Guimarães T, Fracon VS, Silva-Rodrigues APC, Pizeta FA, Souza RM, Sanches RF, Dos Santos RG, Martin-Santos R, Crippa JAS. Clinical validity and intrarater and test-retest reliability of the Structured Clinical Interview for DSM-5 - Clinician Version (SCID-5-CV). *Psychiatry Clin Neurosci* 2019; **73**: 754-760 [PMID: 31490607 DOI: 10.1111/pcn.12931]

24 **Brown E**, Gray R, Lo Monaco S, O'Donoghue B, Nelson B, Thompson A, Francey S, McGorry P. The potential impact of COVID-19 on psychosis: A rapid review of contemporary epidemic and pandemic research. *Schizophr Res* 2020; **222**: 79-87 [PMID: 32389615 DOI: 10.1016/j.schres.2020.05.005]

25 **Smith CM**, Komisar JR, Mourad A, Kincaid BR. COVID-19-associated brief psychotic disorder. *BMJ Case Rep* 2020; **13** [PMID: 32784244 DOI: 10.1136/bcr-2020-236940]

26 **Haddad PM**, Al Abdulla M, Latoo J, Iqbal Y. Brief psychotic disorder associated with quarantine and mild COVID-19. *BMJ Case Rep* 2020; **13** [PMID: 33328211 DOI: 10.1136/bcr-2020-240088]

27 **Xie Q**, Fan F, Fan XP, Wang XJ, Chen MJ, Zhong BL, Chiu HF. COVID-19 patients managed in psychiatric inpatient settings due to first-episode mental disorders in Wuhan, China: clinical characteristics, treatments, outcomes, and our experiences. *Transl Psychiatry* 2020; **10**: 337 [PMID: 33009366 DOI: 10.1038/s41398-020-01022-x]

28 **Beards S**, Gayer-Anderson C, Borges S, Dewey ME, Fisher HL, Morgan C. Life events and psychosis: a review and meta-analysis. *Schizophr Bull* 2013; **39**: 740-747 [PMID: 23671196 DOI: 10.1093/schbul/sbt065]

29 **Pollice R**, Bianchini V, di Mauro S, Mazza M, Verni L, Roncone R, Casacchia M. Cognitive function and clinical symptoms in first-episode psychosis and chronic schizophrenia before and after the 2009 L'Aquila earthquake. *Early Interv Psychiatry* 2012; **6**: 153-158 [PMID: 22171738 DOI: 10.1111/j.1751-7893.2011.00319.x]

30 **Chen H**, Xu J, Mao Y, Sun L, Sun Y, Zhou Y. Positive Coping and Resilience as Mediators Between Negative Symptoms and Disability Among Patients With Schizophrenia. *Front Psychiatry* 2019; **10**: 641 [PMID: 31551832 DOI: 10.3389/fpsyt.2019.00641]

31 **Ered A**, Gibson LE, Maxwell SD, Cooper S, Ellman LM. Coping as a mediator of stress and psychotic-like experiences. *Eur Psychiatry* 2017; **43**: 9-13 [PMID: 28365470 DOI: 10.1016/j.eurpsy.2017.01.327]

32 **Ramalho R**, Adiukwu F, Gashi Bytyçi D, El Hayek S, Gonzalez-Diaz JM, Larnaout A, Grandinetti P, Nofal M, Pereira-Sanchez V, Pinto da Costa M, Ransing R, Teixeira ALS, Shalbafan M, Soler-Vidal J, Syarif Z, Orsolini L. Telepsychiatry During the COVID-19 Pandemic: Development of a Protocol for Telemental Health Care. *Front Psychiatry* 2020; **11**: 552450 [PMID: 33173507 DOI: 10.3389/fpsyt.2020.552450]

33 **Panariello F**, Cellini L, Speciani M, De Ronchi D, Atti AR. How Does SARS-CoV-2 Affect the Central Nervous System? *Front Psychiatry* 2020; **11**: 582345 [PMID: 33304284 DOI: 10.3389/fpsyt.2020.582345]

34 **Starkman MN**. The terrorist attacks of September 11, 2001, as psychological toxin: increase in suicide attempts. *J Nerv Ment Dis* 2006; **194**: 547-550 [PMID: 16840854 DOI: 10.1097/01.nmd.0000224905.61388.39]

35 **Merzagora I**, Mugellini G, Amadasi A, Travaini G. Suicide Risk and the Economic Crisis: An Exploratory Analysis of the Case of Milan. *PLoS One* 2016; **11**: e0166244 [PMID: 28033341 DOI: 10.1371/journal.pone.0166244]

36 **Kültz D**. Evolution of cellular stress response mechanisms. *J Exp Zool A Ecol Integr Physiol* 2020; **333**: 359-378 [PMID: 31970941 DOI: 10.1002/jez.2347]

37 **Kültz D**. Molecular and evolutionary basis of the cellular stress response. *Annu Rev Physiol* 2005; **67**: 225-257 [PMID: 15709958 DOI: 10.1146/annurev.physiol.67.040403.103635]

38 **Kültz D**, Somero GN. Introduction to the special issue: Comparative biology of cellular stress responses in animals. *J Exp Zool A Ecol Integr Physiol* 2020; **333**: 345-349 [PMID: 32588555 DOI: 10.1002/jez.2395]