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COVID-19 and psychopathology: the impact of the pandemic on suicide

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Summary

Background. COVID-19 pandemic led to a radical change in habits and interpersonal relationships that, together with a sense of uncertainty for future and the economic crisis, had a noticeable impact on mental health, with an increase in cases of anxiety, depression, substance abuse. As in previous outbreaks in history one of the most important risks is the possible increase in suicidal behaviors.

Current data. An initial assessment of suicide rates showed different trends in countries all over the world, with a majority of them reporting a decrease in the first phase of the lockdown, followed by an increase. Biological and psychosocial factors affect different levels of risk and particular populations like health workers, elderly and young people, psychiatric patients and abuse victims seem to be most vulnerable.

Prevention strategies. Identifying risk factors is essential to implement preventive strategies, enhancing mental health services and creating new specific measures like COVID-19 help-lines and telemedicine, to ensure continuity of care for patients.

Discussion. Authors of various countries reported a general decrease in suicidal behaviors in the first period of the pandemic emergency, followed by a tendency for them to rise again in the period immediately afterwards. A similar trend has been reported after other catastrophic events and an explanation can be find in the so called "honeymoon period". It is crucial to analize suicide rates of the other stages of the pandemic, still in progress.

Introduction

The COVID-19 pandemic represents a global health emergency that will leave a permanent mark on each of us, with millions of people affected and hundreds of thousands of deaths around the world. Since December 2019 up to now, every country has been facing an unprecedented health crisis that has which made it necessary to take various measures aimed at the containment of the contagion. These measures, such as social distancing, general lockdown, restriction of movement, closure of various businesses, led to a radical change in interpersonal relationships and the way each individual relates to society; these changes, together with the pervasive sense of uncertainty for the future and the economic crisis correlated with the pandemics, had a noticeable impact on the mental health of the population, with an increase in the levels of anxiety, depression, insomnia and substance abuse, as highlighted in some studies [1]. The rise in psychological discomfort and a lack of prevention program could determine an increase in suicidal behaviors in the general population, as already highlighted in previous outbreaks throughout history [2,3] or in other economic crises [4] and as shown

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by some preliminary data in relation to the COVID-19 pandemic [5].

In this article we will try to examine the complexity of suicidal behavior during the pandemic, providing the epidemiological data currently available in the literature, as well as some hypotheses concerning the genesis of this phenomenon and which categories end up being most at risk of developing self-injurious behaviors. Finally, the prevention strategies adopted by different countries to promote mental health and limit the increment of suicidal behaviors will be analyzed.

Comparison with the former world disasters

All major world disasters in history have caused profound cultural, economic, and psychosocial changes: the latter determines the increase in frequency and severity of risk factors for the occurrence of mental disorders and, in particular, suicidal ideation and behavior.

Public health emergencies related to infectious disease outbreaks on a global scale may play a crucial role in this matter, with an impact greater than that of the World Wars [3]. Zortea et al. [6] authored a systematic review collecting the existing evidence on the impact of epidemics occurred between 1889 and 2016 on suicidality, including completed suicides, suicide attempts, suicidal ideation, and self-injurious acts. Regarding suicide-related deaths, it was possible to observe an upsurge during the 2003 SARS outbreak in Hong Kong, with a higher significance for the female gender and a steadily high rate for about one year after the end of the epidemic. Two further studies analyzed focused on the Great Influenza Pandemic of 1910-1920 in America and on the Russian Influenza and its impact on the British population in the period between 1889 and 1893: these cases also showed increased suicide rates compared to the same period in previous years and reasonably correlated with epidemic-related risk factors. Suicide attempts appeared elevated as well, and correlated with the consequences of the SARS, Ebola, and Influenza B outbreaks [6]. Among the numerous studies on SARS and suicide, Tzeng et al. described a group of patients affected by SARS who were at higher risk for developing anxiety, depression, sleep disturbances, PTSD, and suicidal behaviors compared to the control group at a 12-year follow-up [7]. In their review of major respiratory epidemics and suicide risk, Kahil et al. highlight how SARS led to an increase in psychiatric disorders and suicide rates in affected populations, although a reliable association between these two factors appears difficult given the large inhomogeneity of the analyzed studies [8]. Devitt, in his historical paper, after reviewing the data regarding suicides correlated with the greatest disasters in human history, such as World War II, the terrorist attack on the Twin Towers on September 11, 2001, and in London on 7, July 2005, Hurricane Katrina, SARS, and some major economic depressions, concludes that these have been the main causes of the rise in suicide rates over the centuries, proving that protection from recession could also be useful during the pandemic we are currently going through [9].

Comparison with past disasters can lead to the identification of risk and protective factors given by the ongoing pandemic, but it is true that each situation has its own peculiarities, also due to the historical period and current necessities.

Data on suicidal behavior related to the current pandemic

The SARS-CoV-2 pandemic has shown different trends in suicidal behavior in the various countries hit by the virus, and it is now possible to make an initial assessment, bearing in mind that much will remain to be judged in the months and years following the end of the pandemic itself. In Japan, suicide risk was evaluated at different times during the pandemic, showing an initial decrease in the number of suicides of about 20% compared to the same period of the previous year (April), followed by an increase in July, August, and September, with the female gender being the most affected [10,11]. Another Japanese study shows that in the first five months of the pandemic (February to June), the rate was 14% lower than in previous years, attributed to the generous subsidy from the government, the lower burden given by a reduction in working hours and closure of schools, followed by a 16% increase from July to October, which was higher in females (37%) and in children and adolescents (49%) [12]. This trend, displaying an initial decline in the suicide rate in the first phase of the pandemic and switching to an increase during the second phase, fits the “honeymoon” theory; this is characterized by a “protective” period based on the development of a sense of belonging and social cohesion, as well as government-provided assistance, followed by a period of great economic difficulty and psychosocial suffering. These problems, together with the risk factors directly linked to the virus (fear of becoming infected, losing loved ones, etc.), tend to lead to a higher number of suicides in the second phase. This tendency has also been highlighted subsequently to other disasters, such as Hurricane Katrina and the September 11, 2001 terrorist attack [12], and, during the current COVID-19 pandemic, early stage studies conducted in several other countries did show lower rates of suicidality compared to earlier years. In Ireland, fewer hospital admissions due to self-harm are observed in the first period (March-April 2020), which grow exponentially, peaking in mid-May [13]. In Norway, Qin et al. showed a reduction in the number of suicides in the period March-May 2020 compared to the same period in the previous five years, which was attributed to an increase in social cohesion and financial and psychosocial preventive measures implemented by the government [14]; the trend revealed in Austria displayed as well a decrease in the number of suicides between April and September with respect to the same months

from 2006 to 2019 [15], and the same phenomenon was detected in the city of Leipzig, Germany, where a decline in the suicide rate coincided with the enforcement of more restrictive measures [16]. In Paris, a retrospective study examined how admissions due to suicidal behavior among children and adolescents decreased during the lockdown compared to the previous two years, likely due to a reduced tendency to seek help by going to hospitals during the pandemic, but also due to the adoption of coping mechanisms and feelings of belonging and social cohesion [17]; the same result was obtained in Spain, where fewer accesses were found for both suicidal ideation and suicide attempts, in a context of a decrease in accesses for all psychiatric causes in general, probably due to fear of contagion and the presence of restrictive measures [18].
On the contrary, in some countries, an increase in the number of suicides or suicidal behavior in general was highlighted even in the earliest stages of the pandemic. In China, one of the countries most affected by the COVID-19 outbreak in the early stages, an increase in suicidal ideation and attempts has been noted among students in rural areas of the country [19] and among the elderly [20]. In India, Pathare et al. showed an increase in suicide cases reported in the media between March and May 2020 compared to the same period in 2019, but it is unclear whether this is due to a higher focus of the media on suicides during the pandemic [21]; Singh, during a September 2020 commentary, identifies three 'waves of suicides' in India: the first during the period of the first lockdown in March-May, the second during the reintroduction of quarantine at the end of May, and the last at the end of the lockdown due to the economic impact; these would have affected people of different ages, social backgrounds and geographical locations [5]. In the UK, one of the surveys carried out between March and April 2020 confirms the suicide rate generally found in the most vulnerable populations (women, ethnic minorities), with the addition of some new cases deriving from economic problems, the presence of previous psychiatric or chronic illnesses and SARS-CoV-2 infection diagnosis [22], while O'Connor et al. warn of a significant increment in suicidal ideation among young adults in the same period [23].
Many studies were conducted in the United States to identify trends in suicide rates during the pandemic, some of which ending with conflicting results. One of the first surveys (March-April 2020) highlighted how suicidal ideation was more frequent in people with risk factors such as legal problems, conflict with a partner, particular concern about becoming ill, but decreased among people with economic difficulties, as often seen at the beginning of a financial crisis [24]. Ammerman et al. found that 45% of individuals with suicidal ideation early in the epidemic associated it with pandemic-related risk factors, and 9% of the population reported intentional suicidal exposure to the virus [25]. In the state of Texas, visits to a pediatric emergency department were evaluated and it was found that visits related to suicidal ideation or attempts increased significantly during the months when the restrictive measures implemented by the government caused the most stress in the population [26], while in California, the number of calls received by the main Poison Control Center for attempted suicides due to drug use in the first months of the pandemic decreased significantly compared to the same period in the previous two years [27]. In Connecticut, suicide mortality was 13% lower during the lockdown period than during the same months in the former five years, involving nevertheless a relative increase in suicides among racial minorities, suggesting greater social and economic impacts of the pandemic on these populations [28]. A study conducted by a group in New York evaluated the trends of words searched by Americans on Google during the early stages of the outbreak encountering fewer terms that were closely correlated with suicide, but more terms that were related to risk factors for suicide during the pandemic, such as "I lost my job", "unemployment" or "layoff" [29]. The same type of study was conducted in Canada in March, with results showing a reduction in searches for words related to anxiety, suicide and hopelessness, while searches for words associated with survival, hope, resilience, but also sadness, were more numerous [30]. On the other hand, in South America, particularly in Colombia, a survey of 700 people aged between 18 and 76 years showed that 7.6% of the sample had a high risk of suicide, which was related to other depressive symptoms and pandemic-related stressors [31].
Finally, some countries exhibited unchanged rates from previous years; this is the case of Greece [32] or Australia, Queensland, where suicide mortality rates obtained from police reports were unchanged in February-August 2020 compared to 2015 to 2019, but a proportion (n = 36) of suicides committed in 2020 were significantly associated with COVID-related risk factors [33].

Risk factors and most affected populations

Suicidal ideation and suicidal behavior are conditions whose genesis is known to be multifactorial. In the context of the COVID-19 pandemic, there are many causes that may lead to an increase in suicidal behavior, in the short term and in the future. In fact, many different mechanisms come into play in the correlation between the epidemic and the risk of suicide, starting from the biological ones, which depend on the changes caused by the virus or the therapies implemented, to the psychosocial ones, which are related to the restrictions imposed by the pandemic on daily life, to the no less important aspect of the "pre-pandemic" personality of the subject, which can determine, in a certain way, a predisposition to suicide risk in this context. It is therefore important to bear in mind that the increased risk of suicide simultaneously affects not only those directly affected by COVID-19, but also those who have experienced this pandemic indirectly.

Suicidality in COVID+ patients: neuroinflammation and possible side effects of the pharmacological treatment

It is known in the literature that exposure to infectious diseases can cause an increased risk of committing self-harming acts [34].
The underlying causes may be several: the infection and the inflammatory changes themselves might increase the risk of suicidal behavior through neuroinflammation-related processes [35]; the modification of the microbiota, due to the use of antibiotics and antivirals and their influence on the central nervous system, could also be involved [36] or again, the idea of having to fight, for example, an invisible enemy may represent an enormous distress for patients, increasing the risk of anti-conservative ideation.
Data from other respiratory viral infections identify certain clinical phenotypes at risk of suicide. A strong association was found between mood disorders and the presence of antibodies directed against influenza A and B viruses and a strain of coronavirus (HCov-NL63) compared to the control group; in addition, influenza B seropositivity appeared to be significantly associated with a history of anticonservative attempts [37].
Regarding the COVID-19 pandemic, recent evidence in the literature suggests the existence of a possible medium-term neuropsychiatric impairment of patients who contract this virus [38]. A strong association between coronavirus seropositivity and the onset of psychotic symptoms has also been reported (OR = 3.10, CI = 1.27-7.58) [39]. Several mechanisms are likely to participate to the brain involvement secondary to infection: retrograde axonal transport from the respiratory mucosa, peripheral inflammation modulating brain function [40], migration of mononuclear cells carrying the virus across the blood-brain barrier [38].
Recent data in the literature have shown that SARS-CoV-2 is able to enter cells through binding to the ACE-2 (angiotensin-2-converting enzyme) receptor, a central enzyme in the Renin-Angiotensin-Aldosterone system (RAAS), and that alterations in this system are implicated in SARS-CoV-2-induced lung disease and acute respiratory distress syndrome [41].
Previous research has also established that alterations in the RAA system may increase suicide risk, including those secondary to the use of angiotensin receptor blockers [42].
In addition, it appears that certain gene polymorphisms of the ACE enzyme (such as D/D) are associated with an increased risk of suicidal ideation and acts [43]. This preliminary evidence suggests that there is a link between the RAA system and suicidal ideation and, considering the role of this system in the pathogenesis of SARS-CoV-2 infection, further studies are needed to test a possible hypothesis linking the RAA system, SARS-CoV-2 infection and suicidal ideation.
COVID-19 infection appears to be characterized by moderate to severe cytokine storms, caused by an overall dysregulation of the immune system, which seem to be responsible for the death of many patients with this disease. In particular, Interleukin-6 (IL-6) seems to play a key role in the so-called Cytokine Release Syndrome (CRS) and it has been hypothesized that blocking the cascade that leads to increased levels of this cytokine may somehow treat the more severe forms of COVID-19. This is the basic rationale for using monoclonal antibodies, such as Tocilizumab, to treat the cytokine storm induced by COVID-19 in the most severe forms [44]. Interestingly, high levels of IL-6 in the CSF have been associated with impulsive behavior and an increased risk of suicide attempts [44,45]. In the context of COVID-19 disease, increased IL-6 levels may therefore be somewhat related to increased suicide risk.
The evidence currently available thus points to the presence of a psychoneuroimmune alteration in the brain in COVID-19 patients, which may be relevant in determining the psychiatric symptoms of these patients, particularly with regard to the increased suicide risk. The extent to which biological aspects are relevant in determining suicidal behaviour in these patients is currently not known, so further studies correlating disease severity, blood markers of neuroimmunity, and suicide risk are needed to better understand the direct or indirect effect of these elements on suicide risk [46].
The pharmacotherapy currently available for the treatment of COVID-19 is mainly based on the use of antivirals and antibiotics (e.g. Azithromycin, Remdesivir, lopinavir/ritonavir) monoclonal antibodies (tocilizumab), antimalarials (chloroquine, hydroxychloroquine). Numerous studies have been carried out on the possible side effects of currently used treatments, some of which have highlighted possible psychiatric symptoms as collaterals to treatments, particularly with hydroxychloroquine [47]. Even before the COVID-19 pandemic, studies had shown an increased suicide risk in patients with Rheumatoid Arthritis, Malaria or Systemic Lupus Erythematosus treated with Hydroxychloroquine [48,49].
The increased suicidal risk with hydroxychloroquine seems to be secondary to a higher incidence of mood disorders in patients treated with this drug; several pharmacodynamic mechanisms have been hypothesized, such as a dysfunction of serotonergic neurotransmission induced using hydroxychloroquine [50].
A recent pharmacovigilance study showed that in patients with COVID-19 there was an increased incidence of psychiatric manifestations, with increased suicidal behavior and suicidal ideation, in those treated with hydroxychloroquine compared to other available treatments [47]. Although this is an interesting finding, further investigation is needed considering the critical aspects of this study (lack of stratification of patients by severity of illness, absence of assessment of pre-morbid personality and any pre-existing psychiatric disorders).

Psychosocial hypothesis

The COVID-19 pandemic profoundly and dramatically revolutionized the lives of people around the world,

changing habits and customs. Measures that have been taken to control the spread of the virus, such as social distancing, lockdowns, closing businesses, restaurants, and recreational activities, have proven effective in controlling the spread of the virus in individual countries [51]. However, these measures, combined with the impact the pandemic has had on the economy, with a dramatic crisis affecting multiple countries and significantly reducing jobs, have led to a significant raise in psychosocial stress in the general population.

Anxiety, fear of infection, social isolation, uncertainty about the future, and chronic stress linked to rapid changes in infection rates are common feelings that have affected much of the population during this pandemic period, as is now evident in the literature [1].

Such elements may cause an increase in suicidal ideation and anti-conservative acts, as demonstrated in previous epidemics, such as Spanish flu [3], SARS [2] or Ebola [52].

Starting from the measures taken to limit contagions, several theories on psychosocial models of suicide (e.g. Durkheneim's theory, Joiner's interpersonal theory) link the feeling of not belonging to a social group, the feeling of being 'excluded' from society or the presence of extremely rigid rules limiting individual freedoms, to an increased risk of suicidal ideation [53,54].

All this fits perfectly into the reality of the COVID-19 pandemic, where the distancing rules, quarantine, travel restrictions, the deconstruction of normally known social customs and rituals, may have increased feelings of hopelessness, loneliness, low hope and uncertainty for the future, as well as suicidal thoughts and self-harming behaviors experienced as an escape route from a reality perceived as inadequate and frustrating.

In this context, economic uncertainty linked to the crisis in financial systems secondary to the pandemic may be an additional factor in increasing suicide risks. The regulations undertaken to contain the pandemic have led to the closure of many businesses and a major increase in unemployment rates worldwide.

These elements are known to be correlated with an increase in suicide risk, as shown by previous studies that have analyzed the impact of economic crises on mental health and suicide risk [4,55]. In particular, some studies have observed that high rates of unemployment are associated with a higher prevalence of major depression, alcohol and substance use disorder and deaths by suicide [4], with the risk of self-harming behavior being up to 20-30% higher in the unemployed than in the employed [56].

The loss of employment, economic security and uncertainty about the future could therefore be important determinants of increased suicide risk, not only in the short term, but also in the long term when the health emergency is over.

In the context of the psychosocial impact of the COVID-19 pandemic on the increase in suicide risk, one should not forget the so-called "infodemic", a true epidemic of information, often "fake news", that abound on the web and on television. If, on the one hand, social networks and television programs can represent a way to reduce the sense of 'marginalization' and discouragement deriving from social isolation, on the other hand, it is necessary to prevent 'fake-news' and misinformation from spreading, leading to a potential increase in the risk of developing mental problems in categories potentially at risk. In this context, the continuous reporting of negative news about the pandemic increases people's anxiety levels and feelings of hopelessness, both of which may increase suicidal behavior [57].

In addition, receiving continuous news about pandemic-related suicides may increase the risk of suicide by emulation, especially when the methods used to commit the self-harming act are described in detail [58].

The previously analysed determinants of increased suicide risk, such as fear of contagion, social isolation, feelings of uncertainty and hopelessness, economic uncertainty, anxiety and chronic stress secondary to the pandemic, should be placed in the context of the individual's premorbid personality. There are, in fact, some categories of individuals who are more vulnerable and at risk of developing psychiatric problems and suicidal ideation under conditions of particular stress, such as during a pandemic. Subjects with a personality structure characterised by low levels of resilience, for example, have a higher risk of developing suicidal behaviour [57].

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In addition, a recent study on family members of patients infected with COVID-19 demonstrated that lower psychological flexibility (reduced adaptability, perception of living on the margins of society) is correlated with an increased risk of developing suicidal ideation [59].

With regard to patients who have developed COVID-19, there is growing evidence in the literature of a higher risk of suicidal behavior than in the general population, especially for those who have developed more severe forms [60]. Stressful experiences such as being diagnosed with COVID-19, fear of infecting others, and hospitalization, especially in intensive care, can lead to the development of anxiety, depressive disorders and post-traumatic stress disorder (PTSD) [61,62].

In addition, a recent review showed that neurological issues (such as stroke, ataxia, headache, seizures, dizziness) are present in about 25% of patients with COVID-19 [63] and many patients continue to have widespread pain and aches for a long period of time after the acute phase of the disease. Neurological disorders such as stroke, seizures, headaches as well as physical symptoms such as algias and pain, are associated with increased suicidal risk [64,65]. The increase in suicidal behavior in COVID-19 patients thus appears to be of multifactorial genesis, depending not only on the emotional and psychological impact that the experience of COVID-19 leaves on those that were infected, but also on the direct physical consequences that the disease has on the body.

Populations most at risk

Health workers

International attention focused on the psychological condition of health workers on the frontline during the battle against COVID-19. At first defined as heroes and thanked, then exposed to complaints, stigmatized, and discriminated due to the higher chances of getting infected [66] soon afterwards. Chronic stress caused by exposure to the virus, guilt and fear of infecting the loved ones, forced isolation, and pressure at work are all conditions that can contribute to the onset of depression, anxiety, insomnia, burnout, and frustration. Doctors are in themselves a category most at risk of depression, anxiety, and self-harming acts with high lethal rates [67]. In addition to the stress caused by increased workload, isolation and fear of infection, they face the significant emotional cost of increased patient deaths, feelings of helplessness and loss of control, and feelings of self-accusation for not being able to do more [68]. Numerous studies have shown an increase in hopelessness, lowered self-esteem, feelings of guilt and insomnia among workers engaged in fighting SARS-CoV-2 [69]. The international press has reported numerous cases of suicide among health workers involved in emergency management [70]. Anxiety, depressive symptoms, insomnia, and self-harming thoughts have also been reported among family members of frontline emergency responders [71].

Elderly and young people

The elderly population is a particularly vulnerable group to the consequences of the COVID-19 pandemic. In fact, old age, as well as being an important risk factor for severity and mortality from SARS-CoV-2 infection, is a predisposing factor for psychosocial difficulties. The suicide rate of elderly individuals is higher than that of the general population [72] and is particularly high among socially isolated individuals [54]. Social distancing measures dictated by the need to contain the spread of infection may lead to an increase in such isolation and a higher risk of loneliness, depression and suicidality among older people [73]. In the current situation, policies of social distancing and ethical issues related to the need to select patients who are candidates for treatment given the extreme emergency and scarcity of health resources, could favour the perception of being a burden to society and the decrease in the sense of belonging among the elderly [74]; these conditions, according to the interpersonal theory of suicide, can drive an individual to want to commit suicide [54]. On the other hand, among young people there has been an increase in the rate of depression related to the COVID-19 epidemic which could lead to an increase in suicidal acts due to greater economic insecurity [75]. Recently, there has been growing alarm at the increase in self-harm and suicide among children and adolescents [76]. The social disconnection and the difficulty of building a sense of belonging related to the drastic reduction of socialization activities (distance learning, closure of gyms and meeting places) would facilitate the progressive withdrawal and the tendency to take refuge in a virtual world to find some relief.

People with psychiatric disorders or addictions

The presence of psychiatric disorders is an important risk factor for suicidal ideation and behaviour. Cavanagh and colleagues [77] analyzed several studies using the psychological autopsy method and found that 85-95 % of those who died by suicide were likely to have suffered from known or unknown psychiatric problems that may have contributed to their suicidal conduct. People with psychiatric illnesses are among those most affected by the psychosocial effects of the pandemic [78,79] and those at greatest risk of infection and complications due to widespread risky lifestyle habits such as cigarette smoking, poor adherence to suggested precautionary measures and alcohol use [80]. Alcohol and other substances of abuse are a risk factor for suicide both because of their influence on mental health and the risk of dependence they carry, but also due to their potential to be used as lethal means or as facilitators of self-harm; indeed, as many as one third of suicide deaths have a positive toxicological test for substances of abuse [81]. There is ample evidence on the association between alcohol use and suicidal behavior [82]. Psychosocial issues exacerbated by the pandemic, such as family conflict, financial issues and unemployment, may favor alcohol abuse which increases suicidal risk by increasing impulsivity, aggression, feelings of loneliness and loss of hope [80].

Abuse and violence victims

Lockdown policies adopted in various countries have led to an unprecedented situation where households have been forced to share time and space beyond normal routines. Pre-existing conditions of domestic violence, abuse and conflict between family members have been exacerbated by current conditions. Indeed, there has been an increase in reports of domestic violence and abuse often accompanied by suicidal ideation [83].

Prevention strategies

Suicide prevention during the COVID-19 era must be targeted not only to specific risk factors dictated by the pandemic but also to pre-pandemic risk factors that are often inadequately addressed.

Effective prevention strategies require a combination of health, governmental, social and media forces. Government, community and media actions remain the cornerstones of universal suicide prevention interventions, i.e. those interventions targeting the whole population and focusing on specific risk factors. Among them, the following measures have proven effectiveness in suicide risk prevention: restricting access to lethal means, campaigns to reduce hazardous alcohol use, school awareness programs, media accountability in reporting suicide-related news, and government policies to mitigate economic crisis, unemployment and poverty [80]. Among selective interventions, i.e. those interventions targeting individuals at high risk of suicide, the timely pharmacological and psychological treatment of depression and the chain of care and follow-up of patients have a proven preventive effectiveness [80]. In order to cope with the challenges posed by the pandemic emergency, it is necessary to update and adapt preventive strategies by adopting special measures targeted at risk factors specifically induced by the COVID-19 emergency. Suggested special measures include increasing the number of mental health help-lines linked to COVID-19 information services, increasing the number of untraceable domestic violence support hot-lines and raising the awareness of those involved in responding to domestic violence calls (e.g. police). Specific training of primary care professionals for early detection of warning signs [83] and creative collaboration between mental health professionals and media experts to increase the dissemination of anti-stigma messages that encourage help-seeking would also be helpful [84]. Specific interventions on high-risk populations include the strengthening of mental health and addiction services, with a focus on reinforcing telemedicine methods, to ensure continuity of care for patients in need, the increase of treatment options and the opportunity to identify high suicide risk individuals.

Specific training in suicide prevention techniques for mental health and addiction service workers and encouraging the telematic provision of specific screening and treatment for suicide risk would also be desirable [83]. There is a need to ensure immediate and job-neutral access to mental health services for frontline workers and to disseminate suicide prevention programs in schools and workplaces [84]. The promotion of social contacts is another specific intervention essential to mitigate the increased risk brought about by the need for physical distancing. Some authors have demonstrated a high reduction potential (up to 50-60%) in the risk of suicide attempts in a high-risk population by sending 'caring messages' in various forms (letters, postcards, emails or telephone messages) [85]. In this sense, it might be useful to encourage large-scale use of technology (e.g. phone, video calls, texting) to regularly check up on friends and family members. The use of media campaigns to promote social cohesion and the encouragement of community telematic services for communication with individuals living alone, the elderly or marginalized people may also represent effective strategies [84]. Another important aspect to consider in suicide risk prevention during COVID-19 is the media impact of suicide news and its potential "contagious" effect, if reported incorrectly. Collaboration between the media and health services is crucial during this period to fight misinformation and the broadcast of wrong messages about suicide [83]. It is also crucial to raise media awareness on the use of guidelines [86] on the most appropriate and safe way to report suicide news [84].

Discussion

From the early stages of the pandemic emergency there was global alarm for the possibility of a rapid increase in suicidal acts as a result of COVID-19 related issues [87]. In the literature, we have observed a general decrease in anti-conservative acts in the first period of the pandemic emergency, with a tendency for them to rise again in the period immediately afterwards, a phenomenon reported by authors in various countries. It is not unusual to find a stationarity or often a decrease in suicidal acts after catastrophic events involving the entire population of a nation or, as in this case, the world [15]. A similar effect has been reported following terrorist attacks [88], wars [9] and natural disasters [89].

The increase in social cohesion, the so-called 'pulling together' phenomenon [90], could partly explain this trend. In the face of the danger caused by an invisible virus, individual problems may take a back seat, at least for a limited period [15]. The 'honeymoon period' [91], fostered by increased social and community cohesion and mutual support, may have moderated the unfavorable psychosocial impact of the pandemic [92]. From a psychodynamic point of view, the decreased need to transform outward aggression into self-aggressive acts, due to the real perception of an external enemy, may have transiently reduced self-injurious impulses [15]. The COVID-19 period embodies a dual phenomenon, composed of elements belonging to global catastrophes, during which the honeymoon effect was found, and elements typical of periods of deep economic crisis, characterized by a surge in suicide rates [9]. The combination of these elements is unpredictable and could act differently in different populations depending on the stage of the pandemic.

In this historical moment it seems sensible to act expecting the worst and hoping for the best, strengthening as much as possible the suicide prevention systems and mental health services that are lacking in many countries, activating social shock absorbers able to mitigate the devastating effects of the likely imminent global economic

crisis and implementing policies aimed at strengthening social cohesion and encouraging mutual aid among citizens.

The health emergency we are facing has the potential to trigger a series of changes in the structure of society, and therefore a strong institutional and individual commitment is required to ensure that the changes triggered are aimed at improving the protection and integration of the populations most at risk, especially those marginalized and in economic difficulty, using the destructive wave of change to lay the foundations for a new world.

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