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Potential relationship between mental health during the COVID-19 crisis and cardiovascular diseases: time to break the vicious cycle

Mazou Temgoua, Francky Teddy Endomba, Liliane Mfeukeu Kuate, Joel Noutakdie Tochie, William Ngatchou

Submitted to: JMIR Formative Research
on: May 29, 2020

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Table of Contents

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Abstract

Coronavirus disease 2019 (COVID-19) is an on-going global health issue with many mental health consequences including stress, anxiety, depression and suicides. These are known to be associated with cardiovascular diseases which may adversely affect patients' outcomes. As the pandemic progresses, the incidence of mental disorders with high risk of cardiovascular disease also increases and this can negatively impacts disease control of COVID-19 infection. There is an urgent need to break this vicious cycle to reduce burden of COVID-19 disease.

(JMIR Preprints 29/05/2020:20807)
DOI: https://doi.org/10.2196/preprints.20807

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Potential relationship between mental health during the COVID-19 crisis and cardiovascular diseases: time to break the vicious cycle

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Abstract

Coronavirus disease 2019 (COVID-19) is an on-going global health issue with many mental health consequences including stress, anxiety, depression and suicides. These are known to be associated with cardiovascular diseases which may adversely affect patients' outcomes. As the pandemic progresses, the incidence of mental disorders with high risk of cardiovascular disease also increases and this can negatively impacts disease control of COVID-19 infection. There is an urgent need to break this vicious cycle to reduce burden of COVID-19 disease.

Keywords: mental health, COVID-19, Cardiovascular diseases, vicious cycle

Introduction

The recent Coronavirus disease 2019(COVID-19) outbreak in Wuhan turned into a worldwide public health emergency. In 19th April 2020, World Health Organization (WHO) reported that 2 241 359 patients were infected over the world with 152 551 deaths (1). Disease is transmitted mainly through inter-human contact as an air-born disease and has multi-systemic manifestations linked to the direct effect of the virus or inflammatory reactions (2). COVID-19 patients with cardiovascular diseases or risk factors are more frequently admitted in Intensive Care Units (ICU) since they have a higher risk of developing severe complications such as acute respiratory distress syndrome (ARDS), septic shock, cardiac arrythmia and sudden death. A meta-analysis of six studies from China, including 1527 patients reported 9.7%, 16.4% and 17.1% prevalence of diabetes, cardio-cerebrovascular disease and hypertension with respective case fatality rate of 6%, 7.3% and 10.5% (3). In parallel, COVID-19 is associated with various levels of psychological and psychiatric outcomes (4-7). Since mental health affects cardiovascular diseases (CVDs) and considering the fact that COVID-19

burden can be worsened by both conditions (8-11), there is a vicious cycle which is important to break in order to control the pandemic progression.

Mental health during COVID-19 pandemic

High rates of negative psychological outcomes and mental disorders are reported during this pandemic. Park *et al* stipulated that confirmed and suspected COVID-19 patients may experience the fear of the consequences of this infection, including death and severe physical disability (4). Patients presenting COVID-19 symptoms, such as fever, hypoxia, and cough, as well as adverse effects of treatment, such as insomnia caused by corticosteroids, can experience psychological distress (7). Wang and colleagues in a study which enrolled 1210 respondents from 194 cities in China found that 16.5%, 28.8% and 8.1% respectively reported moderate to severe levels of depressive, anxiety and stress symptoms (5). Moreover, quarantine, with resulting stressors such as isolation and boredom, can negatively affects populations mental health (6). Regarding mental health care response pertaining to COVID-19 outbreak in China, Xiang *et al.* suggested three important factors: multidisciplinary mental health teams , clear communication with regular and accurate updates about the COVID-19 outbreak, and establishment of secure services to provide psychological counselling (7).

Relationship between mental health and cardiovascular diseases

Numerous previous studies reported a bidirectional relationship between mental health illnesses and cardiovascular ones. According to Shah and colleagues, some psychological and social factors play a causal role in cardiovascular conditions. These encompass social factors (social class, income, area, type of job), type A personality traits (anger, hostility, antagonistic interactions, cynicism, mistrust), depression and anxiety (10). It has been demonstrated that people with severe psychiatric conditions, including schizophrenia, bipolar disorder, and major depressive disorder have a higher risk of developing Ischemic Heart Disease (IHD) (8). Depressive disorder is directly associated to cardiovascular diseases by accelerating atherosclerosis as well as promoting the onset and severity of the coronary disease risk factors including diabetes, hypertension, and high levels of low-density lipoprotein (12). As anxiety, depression is associated with higher levels of cortisone which can lead to increased blood glucose, body weight gain, low high-density lipoprotein, and blood pressure. Both can also raise sympathetic hormones levels, which can increase resting heart rate, blood pressure, and heart rate response to exertion. All these abnormalities can raise the risk of myocardial infarction, arrhythmias, and heart failure. Depression may also contribute to systemic inflammation and platelets activity. Also, depressive states can lead to unhealthy lifestyle habits, including smoking; hypercaloric diet; as well as physical inactivity and medication non-adherence (12). Anxiety act biologically like

depression but mainly through increasing of sympathetic tone. This can result in rhythms abnormalities including atrial fibrillation, atrial flutter and tachycardia, premature ventricular contractions, acute coronary and hypertensive crisis (9).

Impact of cardiovascular diseases in patients with COVID-19

Cardiovascular risk factors have been found to be significantly associated with COVID-19 mortality. In fact, several studies have showed that patients who are at increased risk of death are those with cardiovascular risk factors like : age >60years, obese, hypertensive, diabetes (2,13,14). Apart from predisposition to atherosclerosis and related risk of ischemic heart disease(15), specific mechanisms have been investigated. Human pathogenic coronaviruses (severe acute respiratory syndrome coronavirus [SARS-CoV] and SARS-CoV-2) bind to their target cells through angiotensin-converting enzyme 2 (ACE2), which is expressed by epithelial cells of the lung, intestine, kidney, and blood vessels (16,17). Although it remains controversial, Fang and colleagues recommend to pay attention of renin angiotensin system blockers. In fact, the expression of ACE2 may be substantially increased in patients with type 1 or type 2 diabetes, who are treated with ACE inhibitors and angiotensin II type-I receptor blockers (ARBs). Hypertension is also treated with ACE inhibitors and ARBs, which results in an upregulation of ACE2(17). Obesity plays an important role in the pathogenesis and severity of COVID-19 infection. Hyper expression of ACE2 has been found in this population leading to increase vulnerability to the infection. Also, obeses patients have higher risk of respiratory distress and major risk of systemic inflammation due to adipose tissue potential. Another important concern is the association with thromboembolism events, a major cause of death in COVID-19 patients (18-20). Myocardial inflammation in COVID-19 is explained by ACE2-related signalling pathways and cytokine storm ; this inflammation induces more consequences in patients with pre-existing cardiovascular risk factors (15).The main consequences secondary to myocardial inflammation are : myocarditis, heart failure, cardiac arrhythmias, acute coronary syndrome, rapid deterioration and sudden death (21).

Breaking the vicious cycle

Considering the huge burden of mental health concerns among COVID-19 patients and their association with cardiovascular diseases/risk factors which can alter the prognosis of critically-ill patients, it appears urgent to develop public health strategies to break this vicious cycle. This strategy includes primary and secondary prevention (See Figure). For primary prevention, Keeping in mind that social media exposure are found to increase anxiety in the community during COVID-19 outbreak (22) it will be helpful to limit this exposition and provide verified information concerning

all aspects of COVID-19 pandemic. Hekroud *et al* found in a population of 1.2 million individuals in the USA that all exercise types were associated with a lower mental health burden (minimum reduction of 11·8% and maximum reduction of 22.3%). The largest associations were seen for popular team sports (22.3% lower), cycling (21.6% lower), and aerobic and gym activities (20.1% lower), as well as durations of 45 min and frequencies of three to five times per week (23). In the context of COVID-19 pandemic, self-physical activity should be encouraged while respecting all COVID-19 preventive measures such as social distancing, wearing face masks and avoiding overcroweded areas.Secondary prevention includes adequate management of mental disorders and cardiovascular disease through online consultations with a psychologist or any trained specialist during this period and encourage physical exercise.

Conclusion

There is a strong relationship between mental health, cardiovascular disease, COVID-19 infection and its severity. It’s urgent to implement primary prevention including reduction of social media exposure and self-physical activity, secondary prevention by adequate management of mental disorders and cardiovascular diseases to break the vicious cycle of the disease.

Author contributions

(I) Conception and design: MNT, FTE

(II) Collection and assembly of data: MNT, FTE, LMK, JNT,WN

(III) Data analysis and interpretation: MNT, FTE, LMK, JNT, WN

(IV) Manuscript writing: All authors

(V) Final approval of manuscript: All authors

Acknowledgments: None

Footnotes

a. Competing interests: The authors declare no competing interest

b. Financial disclose: None

c. Ethical statement: the authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Figure : Ways to break the vicious cycle between COVID-19, mental health problems and cardiovascular diseases

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