

Cognitive Aspects of COVID-19 Pandemic: The Need of “Pandemiology”

Mohammad Sahraei¹ , Homeira Zardoos² , Gholam Hossein Meftahi³ , Hedayat Sahraei^{3*} 

1. School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
2. Dept. of Physiology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
3. Neuroscience Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

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Corresponding Information:

Hedayat Sahraei,

Neuroscience Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

E-Mail: : h.sahraei@bmsu.ac.ir



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Dear Editor in Chief

The COVID-19 pandemic, which started in China in early 2020 and spread around the world two months later, has been studied extensively. For example, the virologists and molecular biologists studied the structure of the virus and the mechanism by which the virus infects human cells to understand the pathogenesis of the virus further and investigate the possible drug and vaccine for the COVID-19 treatment and prevention, respectively. Another line of investigations focused on determining the symptoms of the disease, and recognizing of the people who are susceptible to show a severe form of the disease and even fall victim to the virus (1-2). Due to the novelty of the virus and the lack of knowledge about the effects, new experiments were needed to help health professionals get a clear picture of how the virus infects the people and, consequently, accelerate the treatment of those infected with the virus. Moreover, humans as biological material exhibit stress-related behaviors, including fight or flight reactions to the COVID-19 pandemic (3). In addition, several side effects of the COVID-19 pandemic also were studied, including the effects of the pandemic on the economic income, and the huge waste production consequences of pandemic quarantine and stay-at-home policy (4). These issues led the politicians to follow the recommendations provided by regional health professionals, which was the recommendations offered by the World Health Organization (WHO), which over locks the COVID-19 pandemic issue from an epidemiological viewpoint (5) by announcing the closure of various economic centers and activities along with quarantine and creating social distance to reduce the number of patients and thus reduce the number of casualties. This led to the closure of various businesses around the world, which in turn led to economic crises such as shrinking economies, rising prices for raw and manufactured materials, wides-

pread unemployment in the countries, and the emergence of poverty and hunger in countries, which indicated that the pandemic problems are not resolved by relying on epidemiological rules alone. These facts show that because of the wideness of pandemic consequences which makes it different from an epidemiologic condition, it is difficult to manage the pandemic problems by relying on epidemiological rules. According to the sentences mentioned above, it seems that there is a need to review the pandemic and its management method(s), which requires the convergence of different branches of science, including economy, psychology, management, social sciences, media, medicine, and biology. This convergence can be sorted under a discipline called “PANDEMIOLGY”. One might hope that this new category of knowledge in the future would be able to prevent the catastrophe that new diseases such as COVID-19 impose on human society.

Restrictions for the usage of the hands induced by the COVID-19 pandemic

Humans use their hands in two different ways (Fig. 1), i.e., throwing and clubbing. Under frontal cortex controlling, the hands and figures have different combination movements. The broad spectrum of maneuvers produced by the hands allows the human to do different movements and create the required tools. In addition, humans touch and clean their faces with their hands more frequently and use their hands for food consumption (6). If the hands become contaminated with coronavirus, unwashed corona virus-contaminated hands can transmit the virus to the person. Considering this fact, WHO asks for handwashing for COVID-19 protection. However, the rules provided by the WHO caused more attention and obsessive utilization of the hands, and reduced usage of the hands, which are

among the important evolutionary organs for humans. This situation is considered a potential stressor that can induce two major problems. First, if one arrests primate hands, it may produce a psychotic consequence leading anxiety or depression (or both). The second problem is that restriction of hand use may cause a cognitive deficit. However, this situation which did not discuss by epidemiological rules must be studied in the future.

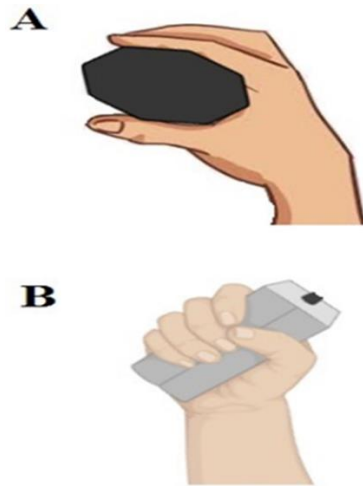


Figure 1. Two main hand maneuvers in the human. A: Throwing, and B: Clubbing. Note that these two hand movements enable the human to use his hands and fingers for a broad spectrum of purposes, including tool making and usage of certain tools.

Change in the artificial lighting time and social jet lag problem

The outbreak of COVID-19 disease as a pandemic has initially disrupted almost every aspect of human daily life activity worldwide, causing many problems, including the long-term closure of schools and universities as the main activity centers for children, adolescents, and young people. Social jet lag is associated with several hazardous consequences for the people in the societies, which are well discussed elsewhere. The incidence of COVID-19 and its mortality and morbidity has forced governments worldwide to lockdown the gathering centers, including the schools and universities, to reduce social contact and reduce the number of COVID-19 suffered as a result. However, the longtime lockdown is shown to change the photoperiod cycle in the youth, and it may induce several consequences, including the effects on cognitive brain function, mental illness, metabolic syndrome, insulin resistance, mitochondrial aging, and cardiovascular disease (7). Considering these facts, it is important to make rehabilitation programs for all the societies’ members, especially the youth, for post-pandemic time. In addition, studies also needed to clarify the impact of COVID-19 lockdown-induced photoperiod cyclical change in youth health. The problem is out of the epidemiology era and needed other branches of science, including chronobiology to be resolved.

Economic aspects of COVID-19 pandemic

COVID-19 lockdown induced severe economic problems all around the world. Poverty is the leading cause of depression and anxiety in the farmers and factory workers, which lose them to invest due to COVID-19 lockdown. Economic challenges are among the worst negative stressors, which have negative influences on the health and diseases induced by low food incoming. The economic crisis and hunger after the long-term COVID-19 lockdown and lower economic income forced the governments to reopen the social activities. This situation leads the governments to choose between disease and hunger (8). The problem is that it needed acceptable policy maneuvers, which are not discussed in epidemiology rules.

Quarantine and sedentary lifestyle

Epidemiological rules emphasize that people must stay at home, which means that they would reduce their activity as much as possible. However, this may induce, and/or even worsen psychological and metabolic problems, including depression, anxiety, anger, obesity, and diabetes mellitus (9). Previous studies indicated that chronic stress (e.g., long-term stay-at-home discipline) could increase the hypothalamic-pituitary-adrenal (HPA) axis activity which increases the plasma concentration of the hormone cortisol. In turn, the increased plasma cortisol increases the carbohydrate and lipid reach food consumption. A body hyper energy situation that does not fulfill body energy requirement (due to immobilization), in fact, produces or worsens obesity at first, but can induce metabolic syndrome and even type 2 diabetes in the future. This problem must be considered one of the main consequences of the COVID-19 stay-at-home order, which epidemiological rules cannot resolve.

Quarantine-induced HPA axis hyperactivity and psychological problems

All the problems discussed in the previous sections have been shown to activate the HPA axis hyperactivity. The HPA axis (Fig. 2), which is the main part of the brain stress system, is regulated by the dorsal hippocampus (inhibitory effect) and basolateral amygdala (excitatory effect). The dorsolateral prefrontal cortex and orbitofrontal cortex control these two brain areas, respectively. Experiencing a long-term stressful event(s) reduces the size and activity of the dorsal hippocampus and dorsolateral prefrontal cortex neurons. In contrast, the basolateral amygdala and orbitofrontal cortex neurons exhibit enlarged size and activity in response to long-term stress. The researchers emphasize that chronic stress can participate in mental disorders, including depression, anxiety, post-traumatic stress disorder (PTSD), suicide thoughts, sleep problems, cognitive dysfunction, as well as metabolic disorders such as hyperphagia, obesity, diabetes mellitus, along with immune system suppression, and cardiovascular system disorders (10). Among these broad-spectrum disorders, stress-induced mental disorders seem to be manifested earlier and wider than the other problems. The bad news of the COVID-19 victims’ death, which is the main part of the newspapers, television, and other media, is among the stress sources. According to the

previous studies, bad news is categorized among the worse psychological stresses. When this news is added to the other stresses, including food deprivation, job loss which leads to poverty, and limitation of hand use, it can induce mental illness. The situation in which could not be managed just by the epidemiological rules.

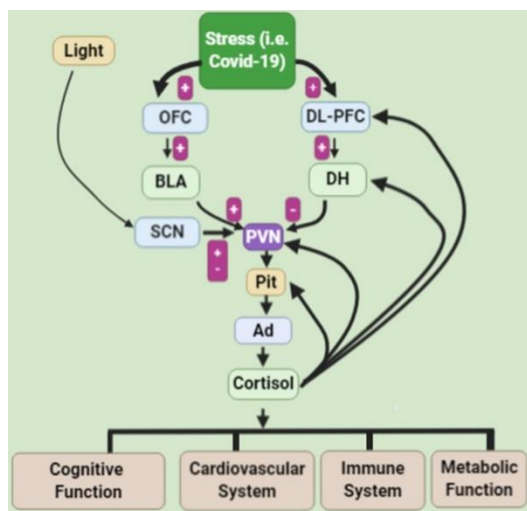


Figure 2. The main sources of hypothalamus paraventricular nucleus (PVN) inhibitory (-) and excitatory (+) inputs. The PVN neurons are under inhibitory inputs which are originated in the dorsolateral prefrontal cortex (DL-PFC) and reach the PVN via the dorsal hippocampus (DH) and excitatory inputs, which are originated from the orbitofrontal cortex (OFC) and reach the PVN via the basolateral amygdala (BLA). Change in the lighting also can influence the PVN activity via the suprachiasmatic nucleus (SCN). Pituitary gland (Pit), Adrenal gland (Ad).

Need to “Pandemiology”

It is unnecessary to emphasize that the COVID-19 pandemic and its consequences are mixed and need a multidisciplinary effort to resolve. Several situations, including excess waste production, food insecurity, job loss and reduced economic income alongside the health service rules to stay at home and lockdown, which imposes sedentary lifestyle to the societies altogether are among the problems that arise from the COVID-19 pandemic. These problems are not considered in the epidemiological rules. It seems that it is time for a reevaluation of the methods used for overcoming the COVID-19 pandemic. For this purpose, one may propose that since the pandemic affects all aspects of human life, it is necessary to open a new branch of science called “PANDEMIOLGY”. Pandemiology should be a multidisciplinary complex science that includes several sciences such as biology, medicine, pharmacy, statistics, economy, policy, media, IT, social sciences, and health (Fig. 3). It is emphasized that several other science branches mentioned above would be added to this list. The importance of this new science branch is that the effect of any pandemic in all aspects of human life is comprehensive and long-lasting and we must be careful with similar situations in the future.

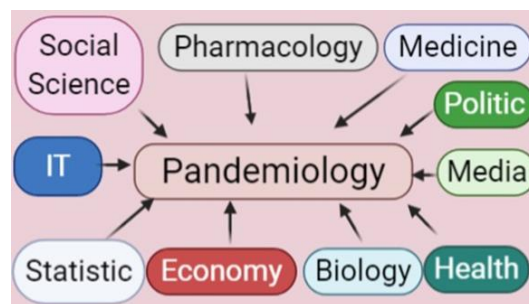


Figure 3. The science branches could be used for the newly established branch “Pandemiology”. It is necessary to be noted that other science branches could be added to this scheme.

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Conflict of Interest

No potential conflict of interest was reported by the author.

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