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Perspective

Stress Physiology, Pandemic: A Global Endocrine Health Concern

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During the current global pandemic of COVID 19, many of us are going through a lot of stress and worries which increases the cortisol hormone levels and is leading us towards a state of chronic stress with each day. COVID-19 is recognized worldwide as a major public health issue due to rapid human-to human transmission. The article summarizes existing knowledge and points out key outstanding research areas to understand inevitable stress due to pandemic and the effects on the body and mind they lead to. Coronavirus Disease 2019 (COVID-19) is a novel disease caused by the newly discovered coronavirus Severe Acute Respiratory Syndrome (SARS) Coronavirus (CoV). After infection the need for quarantine, financial worry and fear of the many unknown things all lead to sleepless nights and act as a stressor to the human population existing on this planet today. The main clinical manifestation that leads to hospital admission is the coronavirus pneumonia [1]. COVID-19 in Wuhan has caused an outbreak and become a major public health issue in China and great concern from international community. Myocarditis and myocardial injury were suspected and may be considered as one of the leading causes for death of COVID-19 patients [2].

COVID-19 initiates rapid stress responses in our body which activates the neuroendocrine HPA stress axis as well as other systems to maintain the homeostasis of our body [3,4]. Our endocrine system manages and regulates the response to all kinds of stresses and worries. But when the endocrine system does not work properly one can have many conditions as diabetes, heart problems. The endocrine system is responsible for production of hormones which send important information to the blood stream. These messages tell our body to regulate breathing, blood pressure, metabolism or so on. Cortisol is the most important hormone as it controls our stress response. It is released as a response to stress for protecting and helping us in defensive mode of "fight or flight". When we are stressed cortisol is released to adapt and respond to stress but too much cortisol is a problem. Long term chronic stress floods our body with cortisol which can further lead to anxiety, depression, heart problem, health problems, weight gain, lower our immunity, etc. Stress could be as important a risk factor as high blood pressure. Feeling constant stress has been linked to higher activity in an area of the brain linked to processing emotions and an increased likelihood of developing heart and circulatory disease. During stress, the amygdala sends a distress signal to our hypothalamus, which then communicates this to the rest of our body so it becomes ready to fight or for flight. The alteration in HPA axis regulation contributes in stress-related disorders [4]. Excessive stress exposure in brain developing stage of childhood may either over sensitize or under sensitize the neuroendocrine stress response and lead to an altered homeo-dynamic state. Studies have shown the link between activity in the amygdala and later heart stroke was due to increased bone-marrow activity and arterial inflammation. Inflammation is a natural immune response to pathogens and injury, an integral part of the stress response and, thus, crucial to tissue healing, adaptation and survival [5-7]. Inflammation of the arteries and activity in the amygdala in highly stressed people, leads to heart attacks, angina and strokes. A heart attack occurs when one or more coronary arteries are blocked by blood clots. However, another unusual form of heart attack is also known to occur when there is some kind of stress. This is called as "takotsubo" cardiomyopathy or stress cardiomyopathy [8]. This type of heart attack does not involve condition of blocked blood vessels or plaques but occurs due to sudden emotional stress.

The interaction between the HPA axis and sympatho-adrenal system plays an important role in an organism's ability to adapt to various stressors they come across. Patients with stress-related disorders are more susceptible to mental health problems for several years after exposure to stress [4]. People surviving after infection with SARS-CoV continue to have elevated stress levels for long duration [9]. A study by Leow., *et al*. had shown a direct effect on the HPA axis in SARS survivors where hypocortisolism was found 3 months after the recovery of patients. HPA dysfunction had largely recovered after one year of their recovery [10]. Although the physical condition of the individuals had improved regularly but their mental health did not. Therefore acute elevations in cortisol levels are beneficial to promoting survival of the fittest but chronic exposure to stress results in reversal of the beneficial effects which can lead to a broad range of problems including mental health disorders, cardiovascular disease and increased susceptibility to infections.

A pandemic such as the ongoing SARS-COV-2 outbreak is bound to have stressful effect for the society in which we live, not only for actually infected individuals but also for those who are not necessarily infected. Many of the recovered individuals experiencing high level of stress are vulnerable to develop serious abnormalities as the endocrine stress axis gets affected, which might lead to long term consequences. The neuroendocrine mechanisms and health practices can lead to immune alteration following stress. All together neuro-immuno-endocrine modulation contributes to the increased risk of developing mental health disorders, cardiovascular diseases and increased susceptibility to infections which could be fatal to life in a pandemic such as COVID-19.

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