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Important Notes and Influences of Stress: Review Article

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ABSTRACT

Background: A stress response is triggered by any physical or psychological stimulation that disturbs balance. Stressors are the stimuli, and the stress response is the physiological and behavioural changes that occur as a result of being exposed to them. Body systems such as the sympathetic-adreno-medulla (SAM), hypothalamus-pituitary-adrenal (HPA), and immunological systems are activated in reaction to stressful situations. It's an adaptability process that helps the body deal with challenges provided by an internal or external stressor. It has maladaptive and detrimental effects on the body's physiology when a stressor is too severe, frequent, or long-lasting (chronic stress). For example, persistent stress can create maladaptive reactions such as depression, anxiety, cognitive impairment, and heart disease.

Objective: Aim of the review article to give an overview about stress and its influences on life.

Methods: PubMed, Google scholar and Science direct were searched using the following keywords: Stress, Internal or external stressor, Chronic stress, Depression and Anxiety. The authors also screened references from the relevant literature, including all the identified studies and reviews, only the most recent or complete study was included between January 2001 and September 2021. Documents in a language apart from English have been excluded as sources for interpretation was not found. Papers apart from main scientific studies had been excluded: documents unavailable as total written text, conversation, conference abstract papers and dissertations.

Conclusion: Stress can cause headaches, high blood pressure, heart disease, diabetes, skin diseases, asthma, arthritis, depression, and anxiety, among other conditions.

Keywords: Anxiety, Chronic stress, Depression, Internal or external stressor, Stress.

INTRODUCTION

A stress response is triggered by anything that upsets the body's natural balance, either affecting physical or psychological functions. To put it another way, stressors are the things that cause us to react in a certain way, and the response is the physical and behavioural changes that follow. the hypothalamus, the pituitary, and the adrenal glands, as well as the immune system are all influenced by stress, and these systems are activated by it [(1)].

Internal or external stressors trigger the body's stress response, which is an adaptive process to help the body deal with the stress. It's not uncommon for the stress response to become maladaptive and damaging if the stressor is too severe, frequent, or long-lasting (repeated acute stress or chronic stress). Chronic stress, for example, can lead to unhelpful reactions such as sadness, anxiety, memory loss, and cardiovascular disease [(2)].

Stress and resilience:

A stressor is a threat to one's health or well-being that one feels they cannot handle. Resilience refers to one's ability to tolerate or recover quickly from hardship, or to one's resistance to stress [(3)].

In contrast, stress adaptation processes are influenced by a person's developmental stage (child or adult), sociocultural variables, and the severity of the external stressor. Adversity, such as war and terrorist attacks, causes some people to give up on their daily struggles despite remaining unaffected by them [(4)]. Anxiety and despair are believed to be negative aspects of resilience [(5)].

It has been found that the medial prefrontal cortex and the hippocampus are linked, as well as multiple other brain circuits, to the stress response [(5)].

Factors affecting stress-related psychopathologies:

- **Age:**

Early life stress raises the likelihood of developing affective pathology later in life, such as depression and anxiety disorders. One substantial stressor experienced throughout childhood, for example, increases the lifetime risk of anxiety or depressive pathology by 30% [(6)]. Importantly, up to 64% of individuals will be exposed to at least one serious stressor during their childhood. A person's lifetime chance of developing emotional disease is more than doubled if they have three or more adverse life experiences [(7)].

- **Gender:**

Gender affects stress related psychiatric disorders, women are nearly twice as likely to suffer from mental health issues as men [(8)].

Stress system- physiology:

It is the limbic system that is activated when a distressing stimulus is sensed by the brain's cortical centres; this includes activation of the sympathetic–adrenal–medullary axis, as well as activation of the renin-angiotensin system. A complicated response is orchestrated by a series of events. In reaction to the challenge, adrenaline and other hormones, as well as neuropeptides, are produced, which govern circulatory and metabolic systems [(9)].

To maintain the initial response mediated by peripherally activated central systems, the HPA axis is

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activated when distressing stimuli persist. Pituitary-derived adrenocorticotropic hormone stimulates the adrenal cortex to produce glucocorticoids as part of the HPA response, which begins with the hypothalamus releasing corticotropin-releasing hormone [10].

Chronic stress develops when a stressful situation becomes too much to handle and cannot be overcome. The negative feedback mechanism of the HPA is disrupted in this scenario. Hyperactivity of the HPA axis, as well as a decrease in glucocorticoids ability to suppress the production of adrenocorticotropic hormone (ACTH) and cortisol, have been found to be often related with these clinical disorders [11].

Neurobiological and systemic effects of chronic stress:

➢ **Effects of chronic stress on brain:**

In addition to volume changes and physical adaptations of neural networks, chronic stress has been linked to macroscopic alterations in specific brain locations. Neuronal plasticity is affected by dendrites atrophy and reduced spine density following stress in the prefrontal cortex and limbic system, as reported in several animal studies [12].

According to these findings, chronic stress may have a role in the development of depressive illnesses through altering brain structure. Images of the brains of patients suffering from stress-related disorders, such as those resulting from acute trauma, big negative life events and long-term psychosocial stressors, show structural changes in the brains [13].

- **Hippocampus:**

Neurons in the hippocampus express significant levels of glucocorticoid and mineralocorticoid receptors. Excitation, chemistry, and structural plasticity are all affected by these receptors [14].

Stress-induced adrenal hormone surges impact cellular processes and cellular plasticity in the hippocampus, resulting to dendritic atrophy, the loss of spines and the inhibition of neurogenesis in the adult dentate gyrus [15]. Reduction of gross hippocampus volume is caused by these cellular processes [16].

- **Stress and anxiety:**

It appears that a number of brain regions are affected by stress and anxiety disorders, such as the basolateral amygdala, the medial prefrontal cortex, and the locus coeruleus [17].

Anxiety and stress are linked by a strong bidirectional relationship in both healthy and pathological settings, according to brain circuits that control both stress and anxiety. As a result, abnormalities in the connection between brain regions that influence stress and anxiety behaviours, such as generalized anxiety disorder (GAD), social anxiety disorders, or post-traumatic stress disorder, could be a contributing factor in their emergence [18].

- **Stress and depression:**

As a dysregulation of the stress response, depression shares many mediators, circuitries, and phenomenologies with stress. This shows a significant relationship between stress and depression. Stressful life events (SLEs) are also linked to an increased incidence of depression, as are the severity and number of SLEs. [19]. Depressed patients and people who are under a lot of chronic stress, for example, have smaller hippocampi, lower levels of neurotrophic factors, and lower levels of neurogenesis [16, 20].

- **Stress and memory:**

It's one of the central nervous systems (CNS's) most crucial functions. The hippocampus is critical to memory function and to the conversion of short-term memory to long-term memory [21].

Several studies documented the impact of stress on hippocampus [6], and as a result affection of memory. Stress hormones in high concentrations can produce declarative memory impairments. Hippocampal atrophy caused by stress in animals has been shown to cause reversible loss of spatial memory [22].

- **Stress and Chronic Neurodegenerative Diseases:**

Examining the neural networks that mediate behavioural and hormonal responses to stress has shown several brain areas where disease-related dysfunctions produce neurodegeneration and the emergence of psychoneurological symptoms [23].

One of the risk factors for chronic neurodegenerative disorders, particularly Alzheimer's disease (AD) and Parkinson's disease (PD), is stress. Other prevalent central nervous system degenerative disorders, such as Huntington's disease (HD) and amyotrophic lateral sclerosis (ALS), have received far less attention, according to an examination of a large collection of published data [24].

Stress in childhood raises the chance of dementia later in life. Furthermore, diseases associated with post-traumatic stress lead to neurodegeneration, whereas chronic stress causes an increase in nonspecific neurodegenerative biomarkers in the cerebrospinal fluid, such as tau protein and amyloid beta 40 (40 amino acid-long A peptide) [24].

➢ **Cardiovascular system:**

A rising body of research demonstrates that psychological stress is strongly linked to cardiovascular disease. Several modest studies published in the recent decade have shown that stress has a substantial role in the progression of cardiovascular disease (CVD) and the risk of acute CVD episodes [25].

An increase in atherosclerosis and an increase in acute cardiovascular disease (CVD) are both correlated with an increase in HPA axis tone and autonomic nervous system activity in response to long-term stress [4].

Changes in the brain, peripheral nervous system, and neuroendocrine pathways are all associated with stress. CVD occurrences were associated to amygdalar activity during a four-year period in one longitudinal study, mediated by vascular inflammation and increased bone-marrow activity [26].

- **Stress and immune system:**

Because stress neuropeptides and hormones are widely produced in immune cells, much study has focused on the

impact of stress on the immune system (IS). Inflammatory biomarkers and cytokines can be elevated in the bloodstream when people are under stress, which can lead to infections and tissue damage [(27)].

A feedback signal from stress-stimulated immune cells, known as cytokines, is sent to the nervous system, which in turn influences brain activity and the release of stress hormones, which in turn alter behaviour and cognitive abilities. A condition of chronic low-grade inflammation that may be a precursor to a range of ailments can be caused by an imbalance in the neuroendocrine/immune system and an overstimulation and breakdown of the neuroimmune axis [(28)].

➢ **Stress management:**

Depending on one's preferences and needs, there are a variety of stress-reduction techniques [(29)]. Stress management includes the following:

- **Mindfulness-Based Stress Reduction (MBSR):**

Mindfulness is characterised as a focused awareness of one's experience, as well as an intentional and nonjudgmental focus on the present moment. Participants in MBSR programme learn breathing meditation, body scanning techniques, and light yoga-inspired physical activities [(30)].

Over the course of eight weeks, participants will learn three formal mindfulness techniques: the "body scan," an attention-focusing method; gentle yoga; and sitting meditation. The body scan is done lying down, with attention directed systematically and nonjudgmentally through various bodily regions, encouraging relaxed awareness and acceptance of proprioceptive and interoceptive feeling. Hatha yoga is a form of yoga that promotes awareness of movement and position through gentle movement and stretching routines. Sitting meditation assists in the development of a stable cognitive perspective from which to observe mental occurrences with openness and acceptance rather than becoming engrossed in distressing thoughts or feelings [(30)].

- **Cognitive behavior therapy (CBT):**

CBT is a type of psychotherapy that is based on the idea that all psychological problems are due to defective thinking. CBT aims to modify thoughts, beliefs, and perceptions, and change behavioral pattern [(31)]**.** Studies have documented that CBT has established benefits [(29-31)]**.**

- **Yoga:**

Stress reduction or relaxation is one of the most widely discussed advantages by yoga practitioners. Yoga focuses on developing spirituality, as well as managing emotions and thinking. The emphasis was initially on breathing awareness and breathing exercises (pranayama) to calm the mind and body and eventually reach a higher state of consciousness. As yoga progressed, physical movement in the form of postures was included, along with yogic breathing (prana) and relaxation techniques. The overall goal is to improve well-being by increasing physical flexibility, reducing discomfort and unpleasant stimuli, and reducing negative thoughts and emotions[(29)].

- **Exercise:**

Exercise is a well-proven method of dealing with psychological stress in general. In a 2017 study conducted by the American Psychological Association, more over half (53%) of adult Americans surveyed said they used exercise to cope with stress [(32)].

- **Relaxation techniques:**

Relaxation techniques are therapeutic exercises that help people reduce tension and anxiety both physically and psychologically. Relaxation techniques have long been a hallmark part of psychotherapy; nevertheless, they can be used in a variety of settings as supplementary therapies to treat patients suffering from a variety of ailments, including but not limited to anxiety, depression, pain, and stress .There are many different relaxation practises available, which can be assisted by a range of health professionals or learnt through self-help [(33)].

- **Tai Chi:**

Tai Chi Chuan (TCC) is one of the Chinese traditional exercises that contains the three treasures of Jing, Qi, and Shen**.** It highlights the significance of performing relaxation and concentration at the same time, as well as the mind and body's vital functions, as well as the harmony and coordination of these two components. TCC practise has recently been shown to improve positive emotions and reduce mental stress, according to growing studies [(34)].

CONCLUSION

Stress can cause headaches, high blood pressure, heart disease, diabetes, skin diseases, asthma, arthritis, depression, and anxiety, among other conditions.

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