

Stress-associated eating leads to obesity

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Obesity is the major health problem worldwide and has now become one of the leading causes of death globally in both adults and children and its prevalence is continuously increasing worldwide.¹ The World Health Organization recently reported that 642 million people were obese in 2014 and this statistics is on the rise globally.² It is also documented that at least 2.6 million people die annually due to obesity worldwide.^{2,3} Health consequences of obesity range from risk of premature death to major health problems such as cardiovascular diseases, arthritis, diabetes, and cancer that cause significant reduction in the overall quality of individuals' life.¹ Authorities from Saudi Arabia mentioned that obesity is one of the leading causes of deaths in the country.⁴ Forbes also listed Saudi Arabia on 29th position with a percentage of 68.3% of Saudis being obese^{4,5} and now it is well established that it is a leading concern of the country, where 7 out of 10 Saudi citizens suffering from it.^{4,6} In 2013, the Ministry of Health of Saudi Arabia conducted a survey on the National Health Information; the rate of obesity among Saudis in the age group of 15 years and above was found to be 28.7% whereas this rate of obesity in the schoolgoing children was 9.3% and in pre-schoolchildren this rate was 6%. As a result of these data on obesity, the Ministry of Health of Saudi Arabia had introduced the program on obesity control.⁶

There are many reasons for the onset of obesity in humans such as excessive eating, lack of physical activities, and lack of exercise, but most importantly it is associated with individual's food of choice, which is strongly depended on individuals that how they are getting influenced by daily stress exposure.⁷ Scientifically, it has been now proved that prolonged stress promotes unhealthy food intake which leads to obesity and other health problems.^{7,8} This stress-eating relation is now become a global concern and it is very common in Saudi Arabia.^{7,9} Stress can be physical or physiological in nature, which has been described previously.^{10,11} Stress initially activates adaptive responses, but if it is prolonged, it causes alterations in the regulatory neural network, resulting

in weakened stress-related adaptive processes and increased risk of serious health problems.¹² Stress-induced mechanisms affecting food intake and obesity are shown in Figure 1. In brief, stress-associated food of choices involve both hormonal and metabolic processes through hypothalamic-pituitary-adrenal axis, which increases the release of glucocorticoids under stressful conditions, which further stimulate the number of signaling events through insulin, leptin, ghrelin, or neuropeptides. These stress-induced signaling events also cause reduction in the lipolysis process, lipolytic growth hormones, and also sex steroids, and ultimately promote fat accumulation.^{7,8} On the other hand, prolonged stress effects on the mesolimbic dopaminergic system and other brain regions that synergistically promote reward feeling toward hyper-palatable foods through metabolic changes in the dopaminergic system that leads to obesity.^{7,8} Studies have also shown that peripheral administration of corticosterone increases dopamine outflow in the nucleus accumbens, therefore glucocorticoids are suggested to contribute to the stress-induced increase

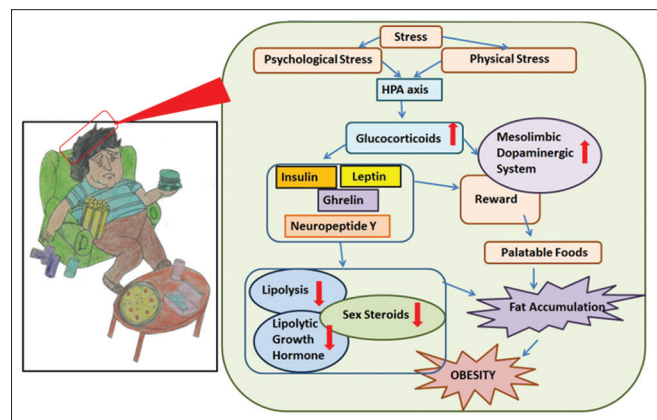


Figure 1: Outlines of stress-induced mechanisms to have an effect on food intake and obesity. The diagrammatic representation of the stress-induced mechanisms (left) is enlarged to show the major events occurring within the brain circuits. Red up arrows indicate increased levels or activation, whereas red down arrows indicate reduction of the processes. HPA axis: Hypothalamic-pituitary-adrenal axis

of dopamine release in this brain area,^{7,8,13} where dopamine acts through several dopamine receptors, which seem to mediate distinct effects on food intake and food preference.^{7,8} Activation of selective dopamine receptors resulted in an increase of caloric intake and preference for highly palatable foods, whereas combined dopaminergic receptors' activation has reported an opposite effect.^{7,8,14} This indicated that it is not very clear to what extent dopamine and its receptors are involved in stress-eating relation, but the data clearly suggest their role in obesity¹⁴ and support further studies.

In my opinion, stress induces wrong choices of food, which may be one of the factors contributing to the onset of obesity. Stress alters the overall eating behavior which is in either ways, over- or under-eating, but prolonged stress appears to be associated with a greater preference for high sugar- and high fat-containing foods, and now molecular evidences clearly suggest that prolonged life stress is causally linked to obesity, however further studies are required to identify solid links between stress-associated hormones and neural circuit which are involved in appetite regulation that would define the molecular mechanisms and possibly lead to develop therapeutic approach for the treatment of obesity and its associated disorders.

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