The Effects Of Obesity On Homeostasis

Obesity is an ongoing disease that is becoming more prevalent in the ever-growing world. Homeostatic regulation is a singular unifying principle in all health protection and illness prevention. Homeostasis maintains a stable equilibrium among its internal components whilst interacting with the external environment. With the effects of obesity ranging from physical, external, it ranges and can have an impact on the body's internal functioning as well. It can also impact the chemical functioning of the body which in turn affects the homeostasis and sufficiency of bodily functions. Obesity can be defined as an abnormal amount of fat deposits being accumulated in the body without the excess intake of calories over time being burned or used. People who suffer from this disease often find themselves with further illnesses that in turn affect their ability to live a normal and healthy life. Such illnesses can become life-threatening or affect the quality of an individual's life if they allow the condition to accumulate to such extents. "The prevalence of BMI of 40 or higher in 2001 was 2.3%. Overweight and obesity were significantly associated with diabetes, high blood pressure, high cholesterol, asthma, arthritis, and poor health status." (MEDICAL JOURNALS AND WEEKLY EDITIONS., 2003). Data has shown that obesity is becoming a major medical issue over the years and this also has a knock-on effect on the secretion of hormones that control homeostasis regulation. The fluctuating release of hormones as such can also lead to mental health issues which have also been largely linked to obesity. A further statement can be made to say that psychological issues within people can also lead to obesity but the main factor causing this would be because of the irregular release of hormones and also for some people this may be genetic or a result of poor lifestyle and dietary choices. Studies have gone to show that people with obesity suffer from extreme physical pain and one of the main causes of obesity currently is the availability of cheap comfort foods. This is more prevalent in the west as processed and packaged foods are readily available for extremely cheap prices. Comfort eating is a term used to describe people who eat for emotional reassurance, this will include them sitting down for prolonged periods of time usually in front of a television or electronic device whilst they unknowingly consume a large number of calories and do not burn it off later. As this becomes normality in western countries , some might go as far as saying it is a lifestyle a lot of people have adapted to, the rise in obesity is prevalent and as this becomes a. World-leading issue , more research is being conducted to see what exactly is causing the fat deposits. Homeostasis is definitely affected by this body condition and it affects can reduce life span drastically and have ongoing effects which become prevalent as the disease prolongs.

Diabetes is the body's inability to produce enough insulin or the body will not react to insulin. This means that the glucose in the blood will remain in the bloodstream and not be used in energy. Diabetes is a chronic medical condition in which sugar or glucose levels build up in your bloodstream. The hormone, insulin, helps move the glucose from your blood and into your cells where it is used for energy. Literature has shown that the UK currently has the highest level of obesity in Europe. Studies suggest that abdominal fat causes fat cells to release 'pro-inflammatory' chemicals, which can make the body less sensitive to the insulin it produces by disrupting the function of insulin-responsive cells and their ability to respond to insulin. The importance of glucose and insulin regulation cannot be expressed as inadequate care lead to the body becoming completely incompetent in producing its own insulin and patients would then need to be referred to taking injections. The hallmark of type 2 diabetes is insulin resistance.

Obesity is also believed to making drastic changes to the metabolic rate of the body, although this is not prevalent immediately this will happen over several years if the right care is not given or sufficient action being taken to reduce these changes from happening.it is also believed that before the official diagnosis of type 2 diabetes, there could be a period of time where the body goes through a phase called prediabetes , currently, there is no known cure for this either but it will be a warning to individuals so that they can control the diabetic progression before it develops into type 2 diabetes. In type 2 diabetes, the body's cells aren't able to respond to insulin as well as they should. In the later stages of the disease, the body may also not produce enough insulin. Type 2 diabetes is described as a combination of low amounts of insulin production from pancreatic beta-cells and peripheral insulin resistance.(Abdullah S Al-Goblan et al, 2014). Until recently, insulin was the only pancreatic ?-cell hormone known to lower blood glucose concentrations. Insulin, a small protein composed of two polypeptide chains containing 51 amino acids, is a key anabolic hormone that is secreted in response to a high blood glucose level and amino acid level following the intake of a meal. Insulin resistance leads to increased fatty acids in the blood plasma, causing an insufficient amount of glucose transport into the muscle cells, as well as rapid fat break-down which will eventually lead to a higher rate of glucose production. Insulin resistance and pancreatic beta-cell malfunction must occur at the same time for type 2 diabetes to become prevalent. "Anyone who is overweight and/or obese has some kind of insulin resistance". (Abdullah S Al-Goblan et al, 2014) but diabetes only develops in those individuals who do not have adequate insulin secretion to match the level of insulin resistance. Insulin in an individual may be high, but it is not enough to make the level of glycemia normal. In order to ensure normal bodily function, the human body is reliant on a regimented control of its blood glucose levels. The pancreas represents a key component by secreting the insulin hormone and its opposition, glucagon. However, disruptions in the exchange and production of the hormones and peptides involved may eventually lead to metabolic disorders such as type 2 diabetes mellitus. "Glucoregulatory hormones include insulin, glucagon, amylin, GLP-1, glucose-dependent insulinotropic peptide (GIP), epinephrine, cortisol, and growth hormone. Of these, insulin and amylin are derived from the ?-cells, glucagon from the ?-cells of the pancreas, and GLP-1 and GIP from the L-cells of the intestine." (Aronoff et al., 2004). Whilst homeostasis is affected by type 2 diabetes and its contributing factors, unless an individual has hereditary factors contributing to them developing this disease, it can be prevented if people are aware of their dietary consumption and can maintain a healthy lifestyle with the recommended amount of daily activity. They will be able to maintain regular homeostasis in the body and their life expectancy will also be increased.

Heart disease is a general term used to describe many types of heart conditions. "Obesity is among the leading causes of elevated cardiovascular disease (CVD) mortality and morbidity."(Akil,2011) Overweight and obesity are defined by the World Health Organization as abnormal or excessive fat that accumulates and present a risk to health. Cardiovascular disease and its link to mortality and morbidity have been shown to be elevated in individuals who are overweight, particularly with central deposition of adipose tissues also known as abdominal fat accumulation.The most commonly diagnosed heart diseases are heart attacks, chest pains, and heart failure. There is no specific age for when heart disease can come about in a person's life but studies have shown that the genetics and behaviour of an individual can contribute as risk factors towards being affected by this disease. Childhood obesity is a complex health issue. It is more likely to occur when the child is well above the normal or healthy weight for his or her age and height. The causes of excess weight gain in young children are similar to that of adults. Behaviours that influence excess weight gain include eating high-calorie, low-nutrient foods and beverages, not getting enough physical activity, sedentary activities such as watching television,

medication use, and sleep routines. The heart is a vital muscle that keeps a human being alive. It is responsible for maintaining a constant supply of oxygen-rich blood to all muscles and organs. “Circulatory homeostasis is associated with interactions between multiple organs, and the disruption of dynamic circulatory homeostasis could be considered as heart failure.” (Kishi, 2016). The heart being the vital organ for providing the body with oxygen means that the entirety of the body’s homeostatic control will be affected if the heart was to malfunction. The complete lack of oxygen will have a domino effect on the rest of the body. Without the circulation of blood, the toxins and waste products such as carbon dioxide and lactic acid will not be removed from the stream of the body. The build-up of such products will have a negative effect on the body’s ability to function causing chemical imbalances and saturations of waste products that can eventually become toxic. The build-up of these products may cause the arteries to become blocked leading to heart attacks which is common in coronary heart disease. A link to obesity here can be the build-up of fat in adipose tissue and a high amount of cholesterol intake in diets leading to cardio vascular disease. High cholesterol intake leads to accumulation of fat in arteries which over time if it is not controlled, can solidify to form a calcium solid build up known as plaque. This will reduce the surface area of the artery which in turn reduces to volume of blood being able to pass through it. This can result in to a myocardial infarction which is commonly known as a heart attack. This potentially can be life threatening and will also be the reason to why some organs and muscles may completely shut down. Heart disease regards the cardiovascular system and in order to maintain homeostasis in the cardiovascular system and provide adequate blood to the tissues, blood flow must be directed continually to the tissues and muscles as they require blood. This also means there is a neural link to the homeostatic control of the heart and this solidifies the vitality of this organ and why regulation of blood and chemicals is essential to the vitality of a human. People diagnosed with congestive heart failure are likely to be affected by it again after the first diagnosis. In light of new research congestive heart failure “is a progressive systemic illness. Its features include oxidative stress in diverse tissues; an immunostimulatory state with circulating pro-inflammatory cytokines; a wasting of soft tissues; and resorption of bone. Its origins are rooted in homeostatic mechanisms gone awry to beget dyshomeostasis.” (Kamalov, Bhattacharya, and Weber, 2010). Heart disease can turn out to be fatal depending on the stages of discovery and also depending on the contributing factors of the individual. However, it is evident that disease does affect homeostatic control of the body’s internal system and it is also evident that is can be cause dire effects if the right care is not given to a patient. Homeostasis cannot be under control if the blood supply is low or muscles become saturated with toxins that cannot be removed. Many of the effects following such diseases often leave the patient with life-long health condition and sometimes dependant on medications also.

“Any cell has the potential to undergo malignant changes and lead to the development of carcinoma. Cancerous cells are not confined to localized overgrowth and infiltration of surrounding tissue but can spread to other parts of the body via lymphatic system” (Medical Association (BMA), 1997; Walter, 1977; Wells, 2001). Obesity is a well-known cause for some cancers. Excess energy from food and drink is stored in the body as fat in adipose tissue. Excess body fat reduces life expectancy and is a cause of a number of chronic diseases. From existing literature it is evident that oesophageal cancer has a direct correlation with obesity. The mechanisms by which oesophageal epithelial homeostasis is regulated has not been studied in great depth. It is becoming clear that many of the pathways that regulate the morphogenesis of epithelium are often also important to regulate epithelial homeostasis in the adult epithelium. This idea seems to be accepted in order for the oesophageal epithelium. “For example, Sox2 is the key tissue-specific transcriptional regulator that regulates the oesophageal epithelial

characteristic during meiosis in the formation of the species. “The association between increasing body mass index (BMI) and EAC has been shown to be dose dependent (14). The risk of EAC in patients with a BMI of 30 or more is approximately 16 times greater compared to those with a BMI of 22 or less.” (Rosekrans et al., 2015). As the rate of obesity increases, the homeostatic system of the body begin to decrease. It is this gradual declination of the body’s ability to maintain a stable chemical balance internally that further contributes to the development of cancers. Postmenopausal women are more prone to gain weight. However, it is not entirely known as to why or how the transition into menopause causes women to gain weight and become more at risk of developing breast cancer . The physiological withdrawal of ovarian sex steroids, oestrogen, and progesterone have been evident in the way metabolism changes after menopause. Cancer is often associated with changes in cellular metabolism and activity. After menopause, lack of ovarian functions leads to the eventual denial of both oestrogen and progesterone production. “chronic inflammation, in the breast of obese postmenopausal women supplies breast epithelial cells with E2 and increases the risk for breast cancer by promoting the growth of hormone receptor-positive breast cancer in these women.” (Boonyaratanakornkit and Pateetin, 2014) the lack of protein receptors alters the homeostatic balance in the production of the epithelial cells in the breast. Just like oesophageal cancer, the growth of hormone receptors causes the cell production to proliferate as the body believes there is a need for the excess cells in the body without a proto-oncogene being present. The overproduction of the cells will then either form a tumour which will make cancer benign or a malignant tumour which spreads to the remainder of the body this overall affecting the homeostatic regulation. Cancer is the rapid reproduction of cells that cannot be stopped. Whilst this occurs and depending on the pace that replication takes place at, it can be concluded that the body will not have its homeostatic environment working optimally. This is because energy is constantly being used up by the reproducing cells. Vital energy sources such as ATP will be used up which will cause fatigue in the rest of the body. As well as obesity being a factor, the body will require much more energy to move muscles which are now surrounded by layers of fat that will obstruct movement. It can be said that the correlation between cancer and obesity is positive and it does affect the homeostasis of the body negatively. Too many areas of the body will be requiring a sufficient supply of energy whether it is ATP or other factors found in blood but due to the overproduction of cells that are not needed , the specific allocation of such proteins cannot be adhered to by the body because e of its size and lack of energetic resources.

Overall it is evident that disruptions in the body’s homeostatic control system will have an adverse effect on an individual. However, this is something that occurs over time and sometimes due to inadequate self-care such as a lack of exercise and poor diets may cause health issues that are not prevalent until later on in life examples of such conditions may be: arthritis, diabetes and heart disease. Homeostatic control is vital to the efficiency of the body. Chemical imbalance and hormonal imbalances have a direct correlation with obesity as literature has shown. Not only will this show physically but for some people who suffer with obesity, they will also be suffering from mental health issues which research has shown puts some people into a cycle where they find themselves picking up harmful habits such as drinking and smoking. Other mental health conditions such a schizophrenia and bulimia have also shown to be major effects that are followed by the progression of obesity. The importance of homeostasis in an individual is evident in almost every part of the human body: regulation of nerves must be efficient so that signals can be sent to the brain, regulation of cell signals must be in place so that conditions like cancer can be prevented and the secretion of the right hormones at the right time is extremely important so that the body is receiving the correct

amount of each hormone when needed such as testosterone, oestrogen, Anti diuretic hormone etc.

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