Obesity as a Public Health Issue and the Effects of Amino Acid Supplementation as a Prevention Mechanism

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This manuscript serves to examine the increasing obesity trend and the harmful medical conditions such as the chronic diseases that can develop as a result of obesity. Probable causes of obesity are discussed, along with suggestions of how to combat the epidemic. Past and present attempts to resolve the issue are compared with further suggestions that could potentially be effective in the future. This manuscript will review several treatment recommendations including the use of amino acid therapy, along with decreased daily caloric intake and increased daily activity. Additionally, there is an emphasis to take preventative measures while simultaneously helping already obese individuals. By implementing new strategies, the increasing obesity trends may be slowed and eventually reversed. If the number of obese individuals decreases, the chronic diseases associated with them will likely decline as well.

Obesity; Public health; Amino acids; Body mass index

Obesity and Public Health

Obesity in the United States is an ever-emerging public health issue that affects approximately 35.7% of adults and over one-third of children [1,2]. It is important to examine the factors that have lead obesity to become a major public health problem. If this issue is not addressed, it is likely that the number of overweight and obese individuals will continue rising to even higher numbers, leading to an increasing number of negative health outcomes and high healthcare costsegaȳp

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the prevalence of obesity has increased, specifically over the last 50 years, obesity is such a common problem that it is seen on a daily basis and spreading not only among adults, but also children. The increased familiarity with obesity remains one hypothesis as to why the number of obese individuals has dramatically increased [7].

Increased calorie accessibility is one reason that caloric intake is increasing among individuals. Advertising, prices, and food availability all promote increased eating, rather than decreasing daily caloric intake. Weight tends to rise when food prices are cheaper at the grocery store and restaurants, and when a wider variety of foods are available. The food industry spends over 30 million dollars annually on advertising, food promotions and discounts [3]. As a result of mass advertising and the easy accessibility to food in fast-food or other restaurants, Americans spend approximately half of their food budget on food that is not prepared at home [3]. This too leads to greater caloric intake, as restaurants and food prepared outside the home typically contains more calories and fat than food that is made at home. In addition, healthy options at restaurants, such as salads tend to be more expensive than less healthy alternatives such as hamburgers and French fries, which lead people to choose the cheaper and sometimes tastier options.

As previously mentioned there are two factors that lead to weight gain; calorie intake and calorie expenditure. From the energy expenditure point of view of the obesity crisis, people are choosing to live more sedentary lifestyles due to many reasons. The increase in technology and white-collar labor as opposed to manual labor has resulted in people spending most of their days sitting at desks, often in front of a computer. Manual labor used to be part of daily work. The advances of the industrial revolution and technology, however, have made exercise a rare part of daily work. Instead of exercise being a part of regular work, it must now come from the limited leisure part of one's day, which is often already very short. This shift in the type of labor performed helps explain why energy expenditure for adults is lower, although it does not explain why energy expenditure is lower for children.

The decrease in energy expenditure among children can be explained by a few different reasons. These include the elimination of physical education classes in public schools due to decreased funding, and "junk-food" advertising that targets children particularly on television. Children also tend to follow the patterns of adult role models. Therefore, when parents' model sedentary lifestyles, children are likely to do so as well. Children's daily caloric intake has also increased due to the fact that children typically eat the same food that their parents eat.

While many suggestions have been made as to how to overcome the obesity epidemic, many have failed, primarily due to lack of funds. If more funds were allocated to promote obesity prevention, the health care costs of caring for obese individuals would ultimately decrease. The cost for caring for obese individuals is nearly 40% higher than the cost of caring for non-obese individuals [8]. Their costs are so much higher because of the fact that obesity increases their chance of many chronic diseases, and they typically require more doctor's visits, medications, and overall medical treatments than non-obese individuals. Despite increased short-term costs, in the long run preventing obesity would help decrease overall future medical costs. Currently the government is spending over $190 billion in annual medical costs as a result of obesity [9]. It is also more effective to implement preventative measures as opposed to correcting poor existing habits and their negative sequelae. Ultimately, an effective preventative strategy must be implemented in order to combat the obesity public health problem in the United States.

Obesity and Chronic Disease

Obesity is characterized by an excess of body fat and or adipose tissue, and can be defined by a BMI greater than 30 kg/m^2 [2]. As a result, excess fat and weight can have detrimental secondary effects on health such as increased risk for many life threatening diseases including diabetes mellitus type 2, cardiovascular disease, hypertension, stroke, arthritis, and many cancers. Research has shown that obesity increases the risk of death from cardiovascular disease by nearly nine fold and death from many cancers by three fold [3]. Since weight is one of the few health conditions over which one has control, it is important to make an attempt to focus on weight and attempt to control and/or prevent many diseases affected by obesity.

Recently, the distribution of excess body fat has been examined. Specific locations, such as waist circumference and waist-to-hip ratio have been shown as precursors for certain chronic diseases [3]. In fact, these excess fat locations may perhaps be a better indication of long-term health effects than BMI alone. The NIH considers a waist circumference of greater than 102 cm. for men, and 88 cm. for women as "high [3]." As a result of high waist circumference, such individuals have increased health risk for hypertension, diabetes mellitus type 2, and dislipidemia, when compared to people with the same BMI and "normal" waist circumferences. Similarly, the waist-to-hip ratio may too be a more significant indicator of Coronary Artery Disease (CAD), than BMI by itself.

Although body fat location is an interesting factor in prediction of certain chronic diseases, BMI is still well correlated with chronic diseases. When considering the correlation between obesity and cancer, malignancies are more common in obese individuals [3]. Overweight and obese patients potentially account for nearly 14% and 20% of all cancer-related deaths in men and women, respectively [3]. In addition to higher mortality risk from cancer, similar findings have been observed in obese patients with relation to diabetes mellitus type 2, dislipidemia, coronary artery disease, and many other health hazards as seen below (Table 2).

Coronary Artery Disease	Adjusted relative risk of 36 for BMI ≥ 29 kg/m^2
Type II Diabetes mellitus and insulin resistance	Type II DM: adjusted relative risk of 61 for BMI ≥ 35 kg/m^2
Hypertension	Estimated to account for up to 26 percent of cases
Dysilipidemia	Reduction in serum high-density-lipoprotein cholestrol of about 5 percent

Venous thrombosis	Adjusted relative risk of 27 for a first episode of VTE for a BMI ≥ 40 kg/m^2
Cholelithiasis	Women 34-59 year old: annual incidence of greater than 1% for BMI ≥ 30kg/m^2
Gout	Adjuste relative risk of 30 for BMI 30-34.9 kg/m^2
Stroke	Adjusted relative risk of 22 for BMI ≥ 32 kg/m^2
Osteoarthritis	

Glutamate is an excitatory neurotransmitter that has been shown to have effects on appetite. Increased intake of glutamate leads to stimulation of brain nuclei that help to control appetite [17]. On the other hand, low levels of glutamate have been connected with imbalances of serotonin levels, another neurotransmitter that affects appetite.

Tryptophan functions as the neurotransmitter precursor for serotonin, an excitatory neurotransmitter that helps suppress appetite. Many obese patients have lower levels of serotonin than non-obese patients [18]. As a result, obese patients experience carbohydrate cravings and increased appetite. Another factor that influences serotonin levels is protein. For patients on a low calorie diet, if protein

individuals are less aware of health risks, and do not have as great an incentive to invest in their health as educated individuals. Nevertheless, nutritional and general education has limited effects, and is difficult to implement.

Taxation on foods that lead to obesity is often suggested but never fully executed. While a tax on certain types of foods, certain ingredients, or objects that may lead to obesity, such as televisions and junk food, might have an effect on obesity, it would be a very costly effort and a difficult one to enforce. Likewise, although it would be ideal to restrict access to fast food restaurants and advertising, it is not realistic, and efforts should be made in areas that are more likely to have a positive outcome.

The ultimate goal is to reduce and prevent obesity on a personal and global scale. The controversial question of how to do this remains unsolved, but nonetheless, we will not know which measures will be effective until they are tried. That being said, a combination of the most cost-effective and previously successful programs, policies, and medications should be implemented and supported. Educational programs, specifically those targeted at children, including physical education classes and anti-obesity advertisements should continue [20]. Exercise programs for overweight and obese individuals should be encouraged, along with a decreased daily caloric intake. As previously stated, these two measures will likely have the most potential when accompanied by an appetite suppressant medication under physician supervision. While many appetite suppressants are available today, amino acid therapy may be the most successful, as the side effects are virtually non-existent. By combining these three preventative measures, we may be able to start controlling the obesity epidemic.

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