Abstract

The obesity epidemic is representative of the dramatic increase of overweight and obese individuals in the past twenty years. Increased prevalence rates have been found regardless of the nation, ethnicity and sex. A genetic predisposition to obesity has been detected, but the tendency to gain excessive weight is attributed primarily to an energy imbalance. High consumption of pre-prepared foods has led to an increase in fat intake, and this is coupled with a decrease in physical activity resulting from labor-saving devices. Thus, more energy is consumed than spent. This imbalance ultimately leads to the excessive weight gain, which causes obesity.

Severe health risks are associated with obesity including several secondary diseases. Obese individuals are likely to develop cardiovascular disease, breast cancer, and type 2 diabetes. Ultimately, if obesity goes untreated, it can lead to death.

Previously, obese individuals have struggled to receive medical attention because insurance companies and doctors did not recognize obesity as a disease. As the epidemic has become more widespread, medical reforms and public policies have been implemented. Government advertisements related to obesity has increased public awareness and allowed for a more comprehensive knowledge of the dangerous threats associated with obesity.

With the development of proper treatments and preventive measures, the obesity epidemic can be better controlled. Weight-loss programs and healthy diets can lead to a decrease in weight and improve other secondary diseases.
Introduction

In the past twenty years, an increase in the percent of overweight and obese individuals has become a major concern of countries worldwide. Although many factors contribute to the excessive weight of these persons, it is clear that an imbalance between caloric intake and energy expenditure is largely responsible. Due to the recent development of the obesity epidemic, secondary diseases that are a result of obesity are just becoming acknowledged. It has been suggested that secondary diseases such as cardiovascular disease, cancer, diabetes, and an increased risk for early morbidity are attributed to the weight of an individual. Concerns regarding available health care and insurance for obese individuals have become a major issue in the political arena. In the United States where thirty-one percent of the population is obese, most are not receiving medical attention from clinicians because insurance companies do not offer financial compensation. The recent prevalence of overweight and obese people needs to be addressed by health care providers and public policies need to be implemented to educate citizens and clinicians in hopes of diminishing the recent increase in prevalence.

The international standard for classifying individuals as either obese or overweight includes a simple computation of their body mass index. BMI is calculated by dividing the individual’s weight in kilograms by their height in meters (Who, 1997). An individual with a BMI exceeding 25 is considered to be overweight. Obese is classified as a BMI over 30. Use of the BMI allows researchers from all over the world to conduct obesity research with a set standard that can be compared across studies. This has opened the doors for a more comprehensive analysis of the degree to which the obesity epidemic extends.
Some experimenters feel that BMI does not account for changes in fat distribution throughout the body. For instance, adiposity specific to the abdominal region cannot be detected. Therefore, other measuring techniques are often used in conjunction with the BMI. Waist circumference is a preferred measurement that determines abdominal fat with the use of a measuring tape. A waist circumference of 35 inches or greater is considered to be risk associated (Aronne et al, 2002). The waist-hip ratio is another commonly used measurement that is calculated by dividing the greatest waist circumference by the largest hip circumference. Risk levels are considered to be .8 or higher (Harris et al, 2000).

The obesity epidemic has received attention from researchers in an attempt to classify a target population. Examining the relationship between obesity and the development of secondary diseases has been another concerning factor in obesity research. In this review, obesity will be evaluated on a national, ethnic, and genetic level in an attempt to localize high-risk populations. Health risks associated with obesity including cardiovascular disease, breast cancer, type 2 diabetes, and mortality will also be examined.

Prevalence

The initial focus of most obesity research involves finding high-risk groups prone to being overweight and obese.

In the United States, it has been reported that there are currently 44.3 million obese adults or about 30.9 percent of the population (Mokdad et al, 2003). Furthermore, if you compare these findings to the estimates of obesity in the 1980s, you will find that the numbers have almost doubled in the past 20 years. This drastic increase seems
uncharacteristic of previous data collected in the 60s and 70s. In that period, the rates of obesity remained fairly consistent (Flegal et al, 2002). Drastic changes in BMI are identifiable with only the past 20 years. In the past decade, the numbers have increased by 74 percent. In the past year alone, an increase of 5.6 percent has been found (Mokdad et al, 2001).

Similar growth is found in the majority of other countries that have been studied in recent years. In Australia, one study revealed a rise from 7.1\% in 1980 to 18.4\% in 2000 of obese individuals. Coupled together with those classified as overweight, over 60\% of the Australian population was found to have a BMI of 25 or higher (Cameron et al, 2003).

The aforementioned studies are restricted to adults typically 18 years and older. Unfortunately, the largest trends in obesity are now being discovered in children and adolescents. As the child continues to develop, they are held to a different BMI scale. Here, if the individual ranks in the 95$^{th}$ percentile based on their age and sex, he/she is considered obese. In the United States, grade school students were studied and an increase in overweight students was found. Overall, about 25 percent of the students polled were found to be overweight (Gordon-Larsen et al, 2003). Brazil and China have also experienced an increased trend towards obesity. Brazil witnessed an increase from 4.1 percent to 13.9 percent from 1974 to 1997 in their youth. Similarly, China had a smaller but still significant increase from 6.4 percent to 7.7 percent from 1991 to 1997. The data available from China did not extend back as far as that from Brazil so perhaps an even larger increase could be detected if the range of the studies were more
comparable (Wang et al, 2002). An increased risk for obesity in East German children ranging from age 5-14 was witnessed as well (Frye and Heinrich, 2003).

It is possible that the abovementioned rates for obesity are underestimated. A national survey is the most common way to collect the data considering the high number of subjects required. Individuals’ self-reported figures on height and weight are typically below the actual value. Therefore, the numbers in the above studies are likely underestimating the true percentage of overweight and obesity in the population.

The obesity epidemic is a worldwide threat that is affecting both children and adults. However, the epidemic is characteristic of only the past ten to twenty years. Perhaps, the economic success that has been experienced by these countries is a contributing factor. It has allowed individuals to live a more sedentary lifestyle, thereby contributing to an energy imbalance.

National

Due to the increased prevalence of obesity worldwide, the examination of obesity trends to specific nations has become essential. The increased caloric intake and decreased energy expenditure that is characteristic of obesity, suggests that financially secure nations could show the highest percentage of obesity. However, underprivileged nations could witness obesity as a result of inadequate health care and improper education. Therefore, it is important to examine the varying socioeconomic status of different nations and its affect on obesity.

In the United States, one study examined the varying socioeconomic status of four ethnic groups (White, Black, Latino, and Asian/Pacific Islander) and the rates of obesity in children and adolescents within that specific group. The tendency for children,
ages 6 to 11, to be overweight was consistent with lower financial status and less parental education. However, in adolescents, ages 12-17, the influence of media and peers were greater than that of the parental socioeconomic status (Haas et al, 2003). A study conducted in Turkey suggested obesity rates could be correlated to financial status and education as well. The findings indicated an important correlation between lower obesity, higher education and financial status. Perhaps, higher educational levels allow a subject to be more knowledgeable of health risks associated with obesity. Therefore, these individuals are more health conscious and keep their weight to a minimum (Ersoy et al, 2004). A Brazilian study detected the highest rates of obesity to be in the wealthier socioeconomic groups. Perhaps, increased rates witnessed in this study resulted from more labor-saving devices and an increase in television watching that is more characteristic of financially stable individuals (Wang et al, 2002). Cameron also found positive correlations between television watching and obesity. Increased viewing times in children and adults correspond to a decrease in physical activity adding to a more sedentary lifestyle and an energy imbalance (Cameron et al, 2003).

Russia, a country who has experienced serious economic stress in recent years, is the only country that witnessed a dramatic decrease in obesity (Wang et al, 2002).

Socioeconomic status plays on important role in the prevalence of obesity in different status groups. However, it is still unclear whether a higher or lower socioeconomic status is responsible for the increased weight. In the US and Turkey, lower financial status correlated to higher obesity prevalence. In Brazil, obesity was linked to the higher socioeconomic groups. Perhaps, socioeconomic status is identifiable with individual nationalities and cannot be generalized worldwide.
Ethnicities

Examining different ethnicities within countries where socioeconomic variables are more constant provides a clearer relationship to obesity. Due to cultural differences, ideal body weights could vary. This would correlate to different trends in body weight specific to that ethnic group.

It has been suggested that African-American women have the greatest tendency to be overweight. Gordon-Larsen actually found the highest percentage of overweight individuals to be African American women in the United States (Gordon-Larsen et al, 2003). Furthermore, when judging ideal body figures, African-American men and women are more likely to choose a larger-sized woman. African-American women were also more satisfied with their body sizes than their Caucasian counterparts (Cachelin et al, 2002). Caucasian females chose the smallest figure sizes and were mostly dissatisfied with their current weight. Among US adults, Caucasian females had a significantly lower rate of overweight and obesity than African-American women; 30 percent versus 49.7 percent (Flegal et al, 2002). When asked to judge their perception of a man’s ideal body size for a woman, all ethnicities choose smaller body sizes than what men actually preferred (Cachelin et al, 2002).

Similar trends were also found in children in the different ethnic groups. Latino and African-American children were found to be the most overweight. But in adolescents, African-American children were not as likely to be obese as Latinos and Asian-Pacific Islanders. These rates were classified only by ethnicity. Because sex was not examined, it is unclear where African-American female children and adolescents fit in the spectrum (Haas et al, 2003).
A difference between ethnicities in relation to ideal body sizes and preferences does seem to play a role in obesity. However, due to the lifestyle and culture of different groups, it has been suggested that ethnic groups carry additional weight in areas specific to that ethnicity. Therefore, it has been suggested that some measurements used to collect obesity data are too standardized. Perhaps the weight ranges depicted in the BMI should be individualized to fit that specific ethnic group (Duncan et al, 2004). One must take caution when reviewing data and be aware of this potential setback.

**Genetics**

Clearly, the environment plays a vital role in weight status. However, the genetic tendency of an individual to be overweight or obese makes them more susceptible to weight gain. Therefore, it is important to examine the genetic effect on obesity.

Twin studies show the largest support for genetic influence in any given behavior. A longitudinal study revealed that twins, even those raised in different environments, showed similar patterns of weight gain and fluctuation (Fabsitz et al, 1994). Weight gain was characteristic to particular ages such as 20 and 60. This suggests that at different ages, certain genes are “turned on” which causes the weight gain at only those periods. Therefore, the individual is more susceptible to environmental influences that could lead to higher weight gain when the genes are “turned on.” Fluctuations around the standard weight are not believed to be biological driven but more likely a result in the changing environment; increased caloric intake or decreased energy expenditure. Individuals who possess a predisposition to being obese are likely to be more overweight than others who do not have this genetic predisposition (Fabsitz et al, 1994). Another adoption study examined the weight gain trends of adopted children. When comparing the child’s BMI
to biological and adopted parents, it was determined that the child exhibited similar tendencies as their biological parents. The shared environment between the adopted parent and child was only influential on the child’s fluctuations around the current body size. Again, this supports the hypothesis that obesity is due to a predisposition. Potential fluctuation around a certain weight is contributed to the surrounding environment (Vogler et al, 1995).

The rise in overweight and obese individuals is not characteristic of a specific sex, ethnicity, or nation. A complex relationship between genetic variables and environmental factors appears to be the best explanation for the recent development of the obesity epidemic. As ready-made foods have become more accessible and sedentary lifestyles more popular, the increase in weight gain continues to grow. Since no specific group appears at particular risk, education and awareness about the health risks associated with obesity must prevail. Hopefully, more knowledge about the life-threatening characteristics of obesity will cause more concern among individuals to eat healthy and exercise. This appears to be the only cure for stopping the obesity epidemic.

**Impacts on Society: Health Risk**

The health risks associated with obesity have only become evident in recent years. Obesity has been found to contribute to the development of a large number of life threatening disorders including hypertension, diabetes, cardiovascular disease, breast cancer, sleep apnea, impaired glucose tolerance and ultimately death (Rippe et al, 1998). Although obesity is not the primary causal mechanism in the development of these diseases, the increased prevalence of obese individuals with these disorders suggest a strong relationship. This reiterates the importance of education and weight-loss programs
as an intervention to stop excessive weight gain and consequently, the formation of associated diseases. The relationship between obesity and cardiovascular disease, diabetes, breast cancer, and mortality will be examined in the following sections.

**Cardiovascular Disease**

Cardiovascular disease, CVD, has been commonly linked with obese individuals. Greece has the second highest obesity rates of all European countries, and as a result, it has seen an increase of deaths due to CVD. Bertsias et al (2003) determined that CVD risk factors increased in obese people. Additionally, abdominal adiposity was the best indicator of potential CVD threats. For this reason, it has been suggested that BMI is not the best indicator of CVD risk. Instead, a combination of techniques measuring waist circumference, waist-hip-ratio and hip circumference to identify the potential development of cardiovascular disease risk factors (Bertsias et al, 2003). Another study also identifies the importance of detecting abdominal obesity when looking at the risk of coronary disease. Again, it was determined that BMI could only convey total obesity. Thus, the best measurements included those that measured fat deposits in certain areas of the body (Lakka et al, 2002). Coronary Artery Disease, hypertension and myocardial infarction normally coexist or lead to the development of CVD. The presence of these diseases is also linked to obesity. In 2002, the prevalence of both coronary heart disease and hypertension associated with obesity was 34% (Aronne et al, 2002).

Myocardial infarction, a heart attack, is a result of the heart receiving inadequate oxygen. A study of 1898 patients who suffered a heart attack four days prior examined the contribution of obesity. Patients ranging from normal weight to class II obese, a BMI of 35 or greater, were included in the study. A relationship between high BMI and the
presence of diabetes and hypertension in younger persons was shown. Furthermore, those with a higher BMI were linked to higher death rates in a four-year follow-up evaluation. This suggests that those patients suffering from obesity had a greater reoccurrence of a heart attack thus increasing their risk of death (Rana et al, 2004).

Coronary Artery Disease, CAD, is caused by a malformation in the blood vessels delivering blood and oxygen to the heart. If the condition is severe, it can lead to myocardial infarction. It is hypothesized that obesity increases the risk for CAD. One study examined 936 women who were experiencing chest discomfort. The subjects were given physical assessments for various measures, one being the BMI. While on a treadmill, subject had to complete numerous tasks, and their oxygen intake was measured. Women with lower fitness scores were linked to higher rates of severe CAD (Wessel et al, 2004). The researchers concluded that overall physical ability was a better judgment of individual CAD risk than was BMI. Although higher BMI values are characteristic of lower physical assessment scores, BMI alone is not a good predictor of CAD. These findings suggest that physical activity should be an integrative part of treatment for CAD (Wessel et al, 2004).

Hypertension or an increase in blood pressure puts additional strain on the heart causing it to work harder. The presence of hypertension leads to an increased risk for cardiovascular disease. Previous findings suggest an increase in hypertension among obese. In normal weight individuals (not overweight or obese), hypertension was two times more prevalent in African-Americans than Caucasians. However, at the highest BMI values, the difference was not as dramatic and the groups became more comparable. On average, hypertension was associated with older subjects and higher BMI values.
Waist-to-hip ratios, which signify abdominal fat, was the most effective measurement for determining hypertension risk factors (Harris et al, 2000).

Overweight and obese individuals are more susceptible to cardiovascular diseases. Although findings do not suggest obesity as the main effect, it is still considered a major contributor.

**Breast Cancer**

The presence of excessive fat has been associated with irregular hormone levels that cause abnormal cell growth present in breast cancer. The increased estrogen levels present in obese individuals can trigger cancerous cell growth. Additionally, decreased activity levels characteristic of obese persons can lead to further development of abnormal hormone levels (Stoll, 1996).

A study examining postmenopausal women witnessed increased levels of the sex hormones estrogen and estradiol in obese participants when compared to their lighter counterparts. The increased hormone levels are connected to lower survival rates in obese individuals diagnosed with breast cancer (McTiernan et al, 2003). However, this study, like most, failed to examine women at in their premenopausal and postmenopausal states. Because of various hormonal changes that occur during menopause, it is has been difficult to find a correlation to track hormonal differences between pre and post-menopausal states. This is an obvious set back in obesity research related to breast cancer because it is only possible to examine postmenopausal hormone levels.

One focus of breast cancer research examines the effect of obesity on survival rates. In a study of 1570 breast cancer patients, survival rates in obese women were examined during a six-year follow-up period. Obese women differed in tumor size from
their non-obese counterparts but not in mortality rates. This suggests that obesity does affect the detection or diagnosis time of breast cancer but not the overall survival rates. Due to an increase in fat tissue or skin density, clinicians are unable to detect tumors as quickly as in normal weight individuals (Carmichael et al, 2004). Another study conducted in Canada agreed that obesity does not result in decreased survival rates. Again, it found a delayed detection time of tumor development in obese women (Jain & Miller, 1997).

Due to abnormal hormone levels present in overweight individuals, obesity can contribute to the development of cancerous cells. It is likely that obesity can delay the detection time of tumor cells, but it does not directly cause a decreased chance for survival. Obesity also causes an abnormal response of cell receptors to insulin in type 2 diabetes.

**Diabetes**

Type 2 diabetes is characterized by high levels of circulating plasma glucose due to a decrease in insulin receptor sensitivity. This imbalance leads to excessive weight gain in the individual. Therefore, type 2 diabetes is a common disease present in obese persons. One effective treatment involves weight loss because it increases the sensitivity of the insulin receptors (Caballero et al, 2003). This would allow high levels of glucose to be recognized by the cell and cause reuptake by other organs and tissue. If normal levels of circulating plasma glucose could be achieved, regular cell metabolism would hopefully lead to a decrease in weight gain.

In a study of 1,457 people, it was determined that fat presence in the abdominal region led to an increase in insulin resistance meaning the insulin receptors were not
responding to high circulating glucose. In comparing obese to non-obese, an inverse relationship was seen between abdominal fat and insulin response. This suggests that obesity caused the difference between groups (Wagenknecht et al, 2003). Clearly, obesity does lead to a decrease in insulin receptors sensitivity.

The most effective way to increase the response of insulin receptors involves weight-loss programs and healthy diets. A study of 24 individuals who were obese and insulin resistant participated in a six-month weight loss intervention that included diet alterations and physical activity. At the end of the program, there was a 6.6% decrease in body weight among participants. More importantly, an increase in receptor sensitivity to insulin was detected (Hamdy et al, 2003). This suggests that type 2 diabetes can be controlled by increasing the response of insulin receptors.

The association between obesity and other health related issues have caused concern within our society. As secondary disease states are becoming linked to obesity, the widespread effects of obesity throughout the body are more evident. Thus far, obesity has been found to increase the chance of cardiovascular diseases including heart attacks and increased blood pressure. Obesity may contribute to a decreased survival rate in breast cancer patients due to delayed detection of cancerous cells. A decrease in cell metabolism as a result of excess body fat not only contributes to type 2 diabetes, but also more weight gain. Ultimately, if obesity is not controlled for, death can be the final outcome. In the United States, 300,000 deaths per year are attributed to obesity (Flegal et al, 2004).

The effect of obesity on society has led to an increased awareness from the media, insurance companies and politicians. The next step in fighting the obesity
epidemic is to find effective ways to prevent excessive weight gain and treat individuals who are already obese.

Health Care

Obese individuals face several obstacles when attempting to receive proper medical treatment for the disease. Clinicians often look at obese patients as being unmotivated and having less care for their body (Rippe et al, 1998). Additionally, most insurance companies do not recognize obesity as a disease and will not provide financial support for treatment. A combination of these effects makes it difficult for obese individuals to receive adequate and affordable medical attention.

The advancement of the obesity epidemic has brought more attention to the need for a medical reform. Changes in public health policies are helping to alleviate many of the obstacles that keep obese persons from receiving health care. Insurance companies are beginning to change their policies and benefits which helps remove the financial burden from the patients. The government is working to increase awareness about the harmful effects of obesity through advertisement and education. Hopefully, these changes will help decrease the prevalence of obesity in the near future.

Access to health benefits

The initial struggle of most obese individuals who are seeking medical attention results from the inability to receive financial support from insurance companies. Most policies do not recognize obesity as a disease. Therefore, seeking medical attention is a struggle for underprivileged families who cannot afford to pay for the cost of treatment.
Blue Cross/ Blue Shield of NC is the first insurance company to recognize obesity as a disease. Hopefully, other insurance companies will follow suit in the near future to help obese persons receive medical attention.

**Who Pays?**

Although most insurance companies are not providing financial support, someone is still paying for the treatment of obesity and its associated diseases. In the United States in 1995, 5.7 percent of the national health spending or $51.6 billion dollars was being spent on obesity attributed medical costs. It was also noted that on average an obese individuals medical bills are 36 % higher than their non-obese counterparts. Although Medicare and Medicaid are supplementing financial responsibilities, individuals are still required to pay as much as 26 % out of pocket (Finkelstein et al, 2003).

In Canada, the economic costs of physical inactivity were calculated using relative risk estimates. Although physical inactivity does not cause obesity, the two characteristics can be linked. 62 % of Canadians were found to be physically inactive which led to a total spending of $2.1 billion dollars or 2.5 percent of health care costs in Canada in 1999. A projection of a 10% decease in physical inactivity would save $150 million dollars per year in health care costs (Katzmarzyk et al, 2000).

**Government Role**

The government’s role in fighting the obesity epidemic only recently began. For so long, the rise in obese individuals went unaddressed. It has been suggested that less than 25 percent of men in the US who are obese have received proper medical attention (Rippe et al, 1998). Now, it has become apparent that proper policies need to be implemented to educate citizens about the potential threats of being overweight. This
epidemic needs to be fought with advertisements, heath notices and an overall greater concern for maintaining a healthy body weight. These policies need to address specific groups that might not receive the proper education in school or at home. The strategies used to combat obesity need to be regulated for particular groups and their current financial and social situation (Ersoy et al, 2004). An increase in government support and policies that promote weight-loss might be the only mechanism to help fight obesity worldwide (Jeffery et al, 2003).

Conclusion

Unfortunately, it appears as though the obesity epidemic is affecting all types of individuals regardless of their age, race, ethnicity or socioeconomic status. Although genetic predisposition may enhance a person’s tendency to gain weight, the changing environment plays a crucial role. Today’s society is purchasing more prepared foods than ever before. These foods are generally more fattening and are distributed in larger quantities. The increase in high-energy food intake along with increased meal size only helps promote increased body weights. Sedentary lifestyles further contribute to the obesity epidemic. Labor savings devices decrease the amount of energy needed to perform a task. Increased television watching interferes with the amount of time spent outside playing especially in children. Together, the increase in fat intake and the decrease in energy expenditure is the major contributor to the increase in overweight and obese individuals worldwide.

The most threatening aspects of obesity involve the increased risk to develop secondary diseases. Obesity has been associated with cardiovascular disease, cancer, diabetes, and death. It has been suggested that obesity affects prognosis and possibly
decreases survival rates. Although many factors contribute to the development of these diseases, obesity seems to be an important factor that needs to be better accounted for. Clinicians need to be more aware of potential risk factors that lead to obesity and caution patients about effective weight-loss programs. It appears that the best treatment is early detection of overweight individuals and an immediate implementation of proper diet and exercise programs. If obesity can be halted in its earliest stages, then a decrease in obesity related diseases would hopefully be seen.

In order to treat these individuals, it is necessary that insurance companies and doctors begin to recognize obesity as a disease. With proper funding from the government and improved public health policies, the dramatic increases in obesity can be properly publicized. This would help improve awareness about other secondary diseases and increase awareness about the risk of being overweight.

Obesity is an all too common trait in our society today. It is time to educate the population on the dangers of being overweight and control this epidemic before it worsens.
References


