**Body Mass Index, Waist Circumference, Obesity, and their Risk Regarding Cancer**

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**Abstract**

Healthcare officials and doctors alike know that the more added fat that an individual has the higher their risk is for developing numerous ailments including cancer. In order to measure the health risks that additional fat has, the healthcare system uses the body mass index and waist circumference. Determining an individual’s health and their risks for developing cancer is greatly important due to the rising obesity crisis. Progress has been made to combat the obesity epidemic as the fight to end obesity is also a fight to decrease the possibility of a cancer diagnosis. An obstacle that researchers in this field face is the criticism of how accurate the body mass index is in computing obesity in individuals and how research studies can only inform the public of its findings. To help end obesity and prevent cancer; public health policies and lifestyle changes must occur as well.

**Introduction**

Health is a disputed topic across the globe due to the increasing obesity epidemic. In just two decades, the global obesity epidemic has risen over 80% with regions including North African and the Middle East averaging even higher rates (Taylor, et al.). Obesity occurs when the “energy consumption is greater than energy expenditure through metabolic processes or physical activity as a result more adipose tissue than genetically determined occurs” (Avgerinos, et al.). Typically, the fat tissue that is accumulated and stored is ectopic fat which is fat that collects around vital organs and blood vessels. Ectopic fat differs from subcutaneous fat which collects under the skin as ectopic fat is regarded as more dangerous and is associated with more health risks (Britton, et al.). Tools used to measure the adipose tissue, overall health, and the nutritional conditions of individuals in the healthcare system are the body mass index (BMI) and more recently waist circumference (WC). The body mass index is a measure of body weight in relation to the height of an individual. It is calculated by dividing the weight in kilograms by the height in meters squared (Janssen, et al.). The index is arranged into three categories consisting of normal weight which ranges between 18.5 - 24.9, overweight which ranges between 25 - 29.9, and obese which is anything greater than or equal to 30. In addition to this the obese category contains two subsets consisting of obese class I and obese class II (Önal). With regards to waist circumference, in recent years it is becoming more popular in terms of evaluating weight loss and overall health risks similar to the body mass index. Healthcare officials warn that people who are obesity are at a higher risk for health issues such as hypertension, diabetes, heart disease and even certain cancers “including endometrial, esophageal, renal and pancreatic adenocarcinomas; hepatocellular carcinoma; gastric cardia cancer; meningioma; multiple myeloma; colorectal, postmenopausal breast, ovarian, gallbladder and thyroid cancers” (Avgerinos, et al.). Results of the principal study by Janssen et al. study indicates that individuals with high waist circumference across the body mass index three categories were more likely to develop health malignancies including “hypertension, diabetes, dyslipidemia, and metabolic syndrome” than individuals with normal range waist circumference even when additional factors including age, race, physical activity, and risk factors (i.e., smoking and alcohol consumption) were evaluated.

Thus, indicating that additional adipose tissue such as ectopic fat that harbors around vital organs negatively impact individual’s overall health and increase their risk of cancer.

Although it is quite evident that excess adipose tissue is detrimental to the health of individuals and increases the risk of certain cancer, a major criticism remains regarding how accurate the body mass index is in calculating obesity.

**Recent Progress**

Recent progress has been done to understand how obesity is linked to cancer from the biological perspective in examining mechanisms including “sex hormones biosynthesis and pathway; factors deriving from ectopic fat deposition”, how weight loss may decrease the risk of cancer, and the gender discrepancy between obesity and cancer risk (Avgerinos, et al). In analyzing the relation between obesity and cancer risk form the biological perspective researchers found that in sex hormones biosynthesis that additional adipose tissue/obesity caused a surplus of estrogen, the sex hormone for females, due to high levels of estrogen and lower level of the sex hormone binding globulin women that have already experienced menopause were at a greater risk for cancer. As high body mass index increases estrogen level which is known to cause tumorigenesis in the tissue that lines the uterus. Regarding factors deriving from ectopic fat deposition, ectopic fat increases the risk of cancers in specific sites such as breast, liver, pancreatic, and hematopoietic. This is due to tumor promotion and growth being modified by changes in the muscle fiber due to inflammatory milieu (Avgerinos, et al). In addition, analyzing the linkage of obesity and cancer risk from the biological perspective, recent progress has been made regarding how weight loss may decrease the risk of cancer and the gender discrepancy between obesity and cancer risk. It was evaluated that deliberate weight loss is recognized as a method for lowering the risk of cancer due to loss of excessive adipose tissue. However, during the analysis it became evident that there was a gender discrepancy between obesity and cancer risk. Women rank higher in cancer diagnosis due to obesity than men. With the greatest diagnosis being esophageal adenocarcinoma in men and endometrial cancer in women (Avgerinos, et al). The study indicated that obese women were more likely to develop cancers involving the female reproductive system while men were more likely to develop other cancers such as colon cancer. The reasoning for these findings are due to men accumulating more ectopic fat around their colon while women the protective qualities of estrogen aid in preventing this form of cancer in women to a certain extent (Avgerinos, et al).

**Discussion**

Although recent progress and new findings for cancer research regarding body mass index, waist circumference, obesity, and cancer risks are great to have. Criticism of how accurate the body mass index is in calculating obesity still remains as well as how much research studies can do to help end obesity and prevent cancer. There as several limitations when it comes to how the body mass index calculates obese in individuals including people that appear in the healthy body mass index range but contain visceral fat and athletic people that are extremely muscular with low body fat. The index does not distinguish lean muscle from adipose tissue therefore healthy individuals are calculated as obese and the index does not factor in the individualistic components such as gender, race, age, or ethnicity leading to increased obesity classification of individuals that may be otherwise health (Avgerinos, et al). The opposite can also be seen when individuals that appear in the normal body mass index range but contain a substantial amount of fat surrounding their organs leading them to believe a false sense of reality regarding their health. These individuals are actually at a great risk for developing site-specific cancer, yet they may under the impression they are due to the body mass index.

Issues also arise when studies used to investigate body mass index with other circumstances such as obesity and cancer risks are called into question because health is not one size fit all like the current body mass index. In addition to this studies being done regarding body mass index, obesity, and cancer risk to inform the public of its findings, yet the global obesity epidemic continues to rise begs the question of when public health policies will be established to help aid individuals struggling with their health due to obesity and are unable to make lifestyle changes on their own. Because in countries like the United States where obesity ranks high, and healthcare and health insurance are considered a luxury and not a necessity. It is hard to combat an overwhelming global epidemic without focusing on the problem by changing public health policies. These public health policies would not be meant to harm people or to impede on their life, but it would make it more accessible no matter socio economic status to gain healthier food.

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