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MORBIDITY ASSOCIATED WITH OBESITY

Amjad Meshal Allahyani , Fatimah Abdullah Alrabeh [2] , Hanan Abdullah Alhajji [2], Fatmah Mohsen Alhejji [3], Sameer Ayed Almaghamsi [4], Feras Abdulwahab Alghamdi [5], Zeyad Saad Aljohani [6], Faisal Ali Alghamdi [6], Abdullah Saleh Almuslam [7], Hussain Abdullah Alkhamis [8] , Saleh Abdulaziz Abubaker [9]

[1] King Abdullah Medical Complex,[2] Medical University of Warsaw-Poland,[3] Lublin Medical University Poland,[4] King Abdulaziz University,[5]Ibn Sina National College,[6] University Of Jeddah,[7] Imam Abdulrahman Bin Faisal University, [8]Prince Saud Bin Jalawy Hospital,[9] Imam Muhammad ibn Saud Islamic University

Abstract:

Introduction: *Body mass index (BMI) is the most commonly used parameter for fatness measurement. It is calculated based on weight and length of an individual by dividing the weight -in kilogram- on the squared length in meter (Kg/M2). The normal BMI slightly differ among genders. However, a BMI ranging from 25.0 to 29.9 kg/m2 is defined as adult overweight. Number high as 30 kg/m2 or more is considered to be obesity.*

Aim of work: *In this review, we will discuss the comorbidities associated with obesity*

Methodology: *We did a systematic search for the comorbidities associated with obesity in the using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). All relevant studies were retrieved and discussed. We only included full articles.*

Conclusions: *With its burden on the healthcare system and individuals' lifestyle, Obesity is an important concern. Believing of obesity as a character flaw has shifted to more in-depth understanding of it is nature as a disease. Obesity is a result of complex interaction between multiple co-variables. Genes, Socioeconomic status, and cultural beliefs, and environmental factors are associated with the development of, and difficulty treating, obesity.*

Key words: *Morbidity, obesity, risk factors, complications.*

Corresponding author:

Amjad Meshal Allahyani ,

King Abdullah Medical Complex

QR code

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INTRODUCTION:

Definition and Incidence of obesity

Body mass index (BMI) is the most commonly used parameter for fatness measurement. It is calculated based on weight and length of an individual by dividing the weight -in kilogram- on the squared length in meter (Kg/M2). The normal BMI slightly differ among genders. However, a BMI ranging from 25.0 to 29.9 kg/m2 is defined as adult overweight. Number high as 30 kg/m2 or more is considered to be obesity [1]. This Parameter is not suitable for children and adolescents age 2 to 18 years. Therefore, the recommendation for this group is a percentile scale which is based on their age and gender to be used [2]. Hence, the definition of overweight and obesity would differ to suit this modality. A weight between the 85th and 94th is considered as an overweight. The 94th percentile is the percentile is the cut-off for obesity.

The association between increased BMI and mortality has been established. Above a BMI of 25, every 5 units increase is associated with increased overall mortality, vascular mortality, and diabetes-related mortality by 29, 41 and 210 percent respectively [3]. The waist circumference, as a method to measure central obesity, has been shown to predict cardio-metabolic that is not directly determined by elevated BMI [4]. The Edmonton staging system for obesity is used to rank the excess adiposity on a 5-point ordinal scale in incorporation with person's obesity-related comorbidities and the functional status. The system was developed to promote the prediction strength and it has been found to be a strong independent predictor of mortality increase. Yet, the best amalgamation of this system with a clinical practice is not clear [5].

The prevalence of overweight or obesity is increasing. In a period of the 3 decades from the eighties, the prevalence increased among children and adults by 47.1% and 27.5% respectively. Nearly the third of the population is considered overweight or obese [6]. Despite the fact that developed countries have a higher prevalence of this problem among all ages, the stated upsurge is observed in the developing countries as well (data from 2013). The prevalence is higher among men in developed countries. in contrast, the developing countries have a higher prevalence among women., The exact opposite is true for women in developing countries; the opposite was seen in developing countries. As an example, the obesity rates for boys and girls younger than 20-year-old are 12.4 % and 12.3 respectively. Nevertheless, for adults age 20 year old or more, 31.7% prevalence was observed among men and 33.9% among women. Although the prevalence was increasing in the 1990s and in the early century, it has been estimated that it remains stationary since 2002 [6].

METHODOLOGY:

We did a systematic search for the comorbidities associated with obesity in the using PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com). All relevant studies were retrieved and discussed. We only included full articles.

The terms used in the search were: Obesity, comorbidities, complications.

Economic Consequences of Obesity

Direct Healthcare Costs

Comparing obese with average weight individuals, there were more than one-third percent increases in the annual healthcare cost and a 77% of medication amongst obese [7]. A large national survey of 21877 individuals from the Medical Expenditure Panel Surveys (MEPS) reported 2006 costs across all non-institutionalized payers (e.g., Medicare, Medicaid, and private insurers). The results have shown that patients who were obese had annual expenses of $1429 on average. This was a 42% higher than patients of normal weight. This fact attributed to about a $40 billion increase in medical spending. For Medicare patients, outpatient services and medications were the main contributors to costs. The obese spent about $600 per year more than normal weight patients [8].

Factors Associated with the Development of Obesity

Nowadays, it is uncertain if there is a single variable with a direct causal relation to obesity. Thus, the current belief that it is associated with complex multifactorial factors. Biological, psychosocial, and behavioral, all of which contribute to obesity development. These include genetic makeup, socioeconomic status, and cultural impacts.[9] In addition, Obesity has been linked to microorganisms, epigenetics, increasing maternal age, multiple childbirth, insomnia and sleep disturbance, endocrine imbalance, and their treatment, and intrauterine and inheritance effects. Although the understanding of pathophysiology is becoming clearer, the prevention and treatment have focused on the psychological and social aspect of the disease. Hence, the best current noninvasive interventions are addressed dietary and behavioral changes. When it comes to treatment, Drug therapy has limited effectiveness, particularly in children. The best results have been achieved by bariatric surgery. Genetic testing could aid a selective

group.

The process of integrating basic science with clinical data is in place, with a hope of results that could be applied in the practical care [10].

Food Choices and Influence on Weight

The choice of food is affected by a variety of environmental motives. Home, child care, the school, the workplace, and the community directly influence the type and amount of caloric intake. The advancement in food processing and preservation in the last century has changed. Fewer fibers, higher fat, simple sugar, and salt have now become more available and affordable than healthier substitutes. These ultra-processed foods have led, since the 1960s, to increase the average caloric intake for individuals by 205 calories more or less [11].

A study conducted by the CDC on about dietary behavior of school students showed that about two-thirds of high school students had been drinking some type of sugar-sweetened beverages (soda, lemonade, sweetened fruit drinks, ice tea, etc.) at least once a day, and about fifth drank them at least 3 times a day. Male and non-Hispanic black students reported eating fast, watched television, and had consumed sugar-sweetened beverages more than other groups. Non-Hispanic and physically active for at least 1 hour per day 5 times a week was less likely to consume these products. One soda could provide 270 to 690 calories depending on its size. Consumption of these beverages is found to be associated with a higher risk of obesity by 1.6 times (95% CI, 1.14-2.24; P = .02) for each extra sugar-sweetened drink consumed daily.[12] Consumption of foods dense in energy is also associated with an increase in waist circumference and BMI. A six-year-long cohort study demonstrated that women consuming a diet with higher energy-dense, grain, meats, and fat had a higher BMI of 1.6 units than women consuming lower energy-dense diets, vegetables.

Relationship of Socioeconomic Factors and Obesity

Physical activity is important in the management of excess weight. As stated before, races and cultures are likely to influence a person's weight. Although racial segregation in metropolitan areas did not have an effect on men, it has been shown to affect obesity rates among women. Black women, living in a highly segregated area was associated with 1.29 time's higher obesity prevalence (95% CI, 1.00-1.65). Conversely, for Mexican-American women, the prevalence was significantly lower (prevalence ratio, 0.54; 95% CI, 0.33-0.90) [13]. The explanation for this association is not fully clear.

Cities and Neighborhood that discourage moderate-intense active transportation such as walking or biking could indirectly influence body weight. As is this activity can promote weight reduction. Studies recommended an engaging in at least 150 minutes of moderate-intensity physical activity a week for adults [14]. Other factors contribute to lack of physical activity are lack of physical education classes and a general cultural belief of the importance of these activity [15].

Urban environment impacts the amount and type of physical activity. A National Longitudinal Study of Adolescent Health demonstrated the relation between a proximity of facilities to the residential locations of 20,745 adolescents who participated in wave I.5 Higher socioeconomic areas have a larger number of physical activity facilities, which in turn, were associated with increased odds ratio of involvement in at least 5 sessions of physical activity per week among adolescent. Hence, decreased rates of adolescents being overweight.

Genetics and Obesity

Numerous gene products may contribute to obesity development. Li and colleagues identified 12 obesity-susceptible loci. They examined the relationship between these loci and weight, height, BMI, and waist circumference. This was in combination with the predictive value for obesity risk. Variants had a cumulative effect on obesity measures, with each additional allele associated with an increase in weight of 444 g and increased risk of obesity by 10.8%. However, when combining these alleles a limited predictive value for obesity risk was found.

Genetic influences on BMI is suggested to be strongly correlated.27 This correlation was studied on identical and fraternal twins raised together and apart to minimize the influence of the environment. The correlations between BMI of identical twins reared apart were 0.70 and 0.66 for men and women respectively. This result means that genetic influence was independent of the environment. Another cohort comparison addressed the body of adult twins reared apart versus a control group of twins reared together. The researcher concluded that that body fat is strongly associated with genetic. About 60% of body fat of individual could be attributed to their genes; however, the remaining 40% percent must be caused by other factors rather than genes alone.

A study of identical (monozygotic) and fraternal (dizygotic) twins examined the different methods of

fat measurement and found them to be similar between genders. The variance range for BMI and body fat percentage was 0.58 to 0.63; 0.48 to 0.69 for total skin folds; 0.61 for men and 0.48 for women waist circumference. The researches have concluded that genetics may help to determine who might become obese, and the environment may determine the extent of obesity [16].

Gut Microbiota (Microorganism)

The bacteria, viruses, archaea, and eukaryotic microbes residing outside or inside people body have a potential impact on physiological process b their involvement in metabolic function [17]. Gut microbiota may increase the energy harvest. Consequently, an obese microbiome could result in greater total body fat than a lean microbiome. Altering the percentage and normal pattern of microbiota to prevent or treat obesity need to be studied in controlled trials**.**

Chronodisruption

Many suggested an associated between Chronodisruption and development of obesity, prediabetes, diabetes, and lipid disorders. Chronodisruption can be induced by irregular day rhythms, sleep deprivation, an altering the normal rhythm of eating [18].

Relationship between Hormones and Weight

A high degree of control and cooperation, to maintain adequate food intake, take a place between neural and hormonal signals from one hand and the gut and central nervous system (CNS) from the other. Hormones, such as the glucagon-like peptide (GLP), oxyntomodulin (OXM), leptin, peptide tyrosine-tyrosine (PYY), and cholecystokinin (CCK), signal to areas in the CNS to control appetite and the feel of fullness and hunger [19]. These hormones level is found to be directly proportioned to amount of ingested calories and composition of a meal.

Obesity and Associated Conditions

Conditions associated with Weight Gain

Hypothyroidism, Cushing's syndrome, polycystic ovary syndrome (PCOS), and some neurologic problems are associated with excess weight [20].

Hypothyroidism

Thyroid has a direct effect on metabolism and thermogenesis and hence, the body weight. Thyroid hormones affect glucose and lipid metabolism. Hypothyroidism is associated with weight gain and development of obesity in a complex manner. The increase in thyroid stimulating hormone (TSH) levels has been noticed with higher BMI. Thus, obesity has been suggested to impact the hypothalamic-pituitary-thyroid axis by alternating thyroid function tests in a similar way observed with primary hypothyroidism. However, the weight gain observed with hypothyroidism is believed to be a result of fluid retention. Body composition was studied before and after the treatment of hypothyroidism; the results showed that observed weight loss is due the decrease in lean body mass rather than the fat mass [21].

Cushing's syndrome

A long-term exposure to glucocorticoid is seen in Cushing's syndrome patients, a rare disease in the United States. Obesity with mild hypercortisolism, diabetes, and hypertension may have Cushing's syndrome. A sudden weight gain and central obesity is a common feature. Screening of 150 obese patients showed that about a one-tenth of them had Cushing's syndrome. Unless the patient exhibits other clinical features of the disease (poorly controlled hypertension, hypokalemia unresponsive to treatment, diabetes, or rapidly progressing osteoporosis), clinicians often do not prompt screen patients with obesity for Cushing's syndrome. The researchers suggest a routine screening for patients with for Cushing's.22

Polycystic Ovary Syndrome

PCOS is characterized by irregular menstrual periods, excess hair growth, infertility, severe acne, oily skin, ovarian cysts, patches of thickened dark skin, and obesity. American College of Obstetrics and Gynecology estimated that about 80% of women with PCOS are obese, with a 6 to 7 fold increase in the prevalence of morbid obesity compared with a control group.[23] Increased body fat is incriminated in raising androgen levels by peripheral aromatization, hence the adipose level should be screened. Furthermore, weight reduction can positively affect hormone balance in these women. Seventeen out of 36 premenopausal women undergoing bariatric surgery were found to have PCOS. After a year of follow-up and mean weight loss of 41 Kg, the hirsutism was declined, the hormonal balance was restored.

Obesity as a Risk Factor for comorbid diseases.

Obesity is estimated to have variable impacts of disease development. Obese patients with BMI of 40 kg/m2 or higher have a seven-fold increase in the risk of diabetes, six fold of hypertension, Two, three and four folds higher risk hyperlipidemia, asthma, and arthritis respectively [24].

Rheumatoid Arthritis, Non-allergic Rhinitis, and Major Depressive Disorder.

The risk of chronic conditions such as rheumatoid arthritis (RA) and non-allergic rhinitis is increased in obese people. A large meta-analysis of 13 studies and less than half-million individuals concluded a relative risk for RA of 1.21 and this risk increased for every 5 units raise in BMI.58 Despite the lack of relation between allergic rhinitis and obesity, many research proposed a proportional associate with non-allergic rhinitis with estimated OR to range between 0.88 to 1.43 for obese children and adults. The risk for major depressive disorder significantly increases with obesity, especially among women [25].

Cancer

The risks of different cancers increased variably with obesity. An evaluation of the collected data of 5.2 million people was conducted. Thirteen of the 22 cancers were associated with overweight or obesity. Slightly less than 50 percent of uterine cancer and more than 10% of gallbladder, kidney, liver, and colon cancers were incriminated by being overweight or obese. Another study demonstrated a relationship between obesity and cancer-related deaths in the United States. The mortality from cancer was attributed to being overweight and obesity ranged from 4.2% to 19.8%. Interestingly, maintaining a BMI at 25 kg/m2 or lower could prevent 90,000 deaths per year from cancer [26].

CONCLUSION:

With its burden on the healthcare system and individuals' lifestyle, Obesity is an important concern. Believing of obesity as a character flaw has shifted to more in-depth understanding of it is nature as a disease. This would motivate healthcare professionals to prompt intervention when individuals are identified to be at risk or if they have met the definition of obesity. Understanding the pathophysiology of variable drugs and disease-related to obesity would be essential for both physicians and pharmaceutical developer, this would aid the adequate identification and hence the choice of medical therapy. Healthcare provider awareness about risk factors is important for prevention and should take a place in counseling people about avoiding these risks.

Obesity is a result of complex interaction between multiple co-variables. Genes, Socioeconomic status, and cultural beliefs, and environmental factors are associated with the development of, and difficulty treating, obesity. The prevalence of obesity continues to rise with a direct reflection on comorbidities and healthcare costs. Early intervention and effective treatment of obesity are the mainstays to reduce costs and improve outcomes for these patients.

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