Journal of Developing Drugs

Wang et al., J Dev Drugs 2017, 6:1
DOI: 10.4172/2329-6631.1000e153

Editorial OMICS International

Association between Obesity and Cardiovascular Disease: Is There One?

Amy Zhe Wang*, **Amrit Saini, Noosrat Hyder**

Department of Pharmacy, Long Island University, New York, USA

***Corresponding author:** Amy Z Wang, Department of Pharmacy, Long Island University, New York, USA, Tel: 718-780-5583; E-mail: amy.wang@liu.edu

Received date: April 28, 2017; **Accepted date:** May 03, 2017; **Published date:** May 10, 2017

Editorial

Obesity is an epidemic in the United States, and affects around one-third of the population in the United States. Diagnosis of obesity is generally based on body mass index (BMI), which estimates total body fat content. BMI is calculated by dividing body weight (in kilograms) over body surface area (in meters squared). Based on the standards established by the National Heart, Lung, and Blood Institute, normal weight is defined as BMI of 18.5 to 24.9 kg/m^2. Patients with BMI of 25 to 29.9 kg/m^2 are considered to be overweight, while those with BMI greater than 30 are classified as being obese. The obese category is further divided into 3 categories: grade 1 (BMI 30 to 34.9 kg/m^2), grade 2 (BMI 35 to 39.9 kg/m^2), and grade 3 (BMI of 40 or higher) [1]. However, the association between obesity and cardiovascular (CV) disease is not clearly established, and being underweight may even increase the risk of heart disease.

The association between overweight and risks of CV disease or death was investigated in several studies. A cohort study of 504 overweight children in Stockholm, Sweden investigated the association of being overweight in adulthood and morbidity or mortality. Children were recruited from 1921 to 1947, and were between the ages of 2 months to 16 years. The investigators recorded weight for 40 years with 10-year interval follow-ups (most recent follow-up conducted between the years 1980 to 1983). Participants reported comorbidities, including CV disease and diabetes. Overall, average age of death was 41.3 years, and CV disease (43.6%) was the most common cause of death. There was no significant difference between the BMI of the deceased and alive group at various age groups, except the BMIs during puberty and at age 25 were significantly higher in the deceased group ($p<0.05$). Patients with reported CV disease had higher BMI throughout most of their lifetime compared to those who did not report CV disease ($p \leq 0.01$). Patients who reported diabetes had a significant increase in BMI between post puberty and 25 years of age (BMI increased from 25.8 to 30.7 kg/m^2), and weighed more throughout most of their adult life ($p \leq 0.001$) [2]. A systematic review and meta-analysis investigated the correlation between all-cause mortality and obesity. The investigators concluded that obesity (BMI>35) with was associated with higher all-cause mortality (HR: 1.29; 95% CI: 1.18-1.41). However, grade 1 obesity group had comparable all-cause mortality rates (HR: 0.95; 95% CI: 0.88-1.01), while overweight patients had significantly lower risks of all-cause mortality (HR: 0.94; 95% CI: 0.91-0.96) compared to the normal weight group [3]. Another study combined data from 5 registries to investigate impact of obesity on mortality in patients with elevated risk for heart failure (HF) or myocardial infarction (MI). A total of 21,570 patients with MI or HF were included. In a multivariable analysis, association between BMI and mortality was found to be a U-shaped curve. Risks of death were lower in the pre-obese group (HR: 0.91; 95% CI: 0.87-0.96). Underweight and obese grade 2 patients had increased mortality risk compared to normal weight patients (underweight HR: 1.46; 95% CI: 1.32-1.60; obese HR: 1.15; 95% CI: 1.03-1.3) [4].

According to the British Regional Heart Study, which recruited 7735 men from 24 towns in Great Britain, increasing BMI was associated with increasing risks of heart disease. All-cause mortality was lowest between BMI of 22 to 27.9 kg/m^2. Mortality was significantly higher for BMI of less than 20, or 30 and above. Risks of CV death were significantly higher for patients with BMI of 24 or higher, except for the group with BMI of 26. Risk of developing heart disease was also significant at BMI of 24 and above, but risk of stroke was not associated with any level of BMI [5]. A meta-analysis of 3 historical cohort studies assessed the association of childhood BMI with the risk of adult CV disease and stroke. BMI and mortality data of children were obtained from the National Health Service Central Registry. No association was found between early life BMI and risk of death from CV disease or stroke ($p=0.12$ and 0.4, respectively) [6]. A post hoc analysis of the I-PRESERVE trial attempted to identify a correlation between BMI and CV death in patients with HF with preserved ejection fraction. Primary endpoint was a composite of death from any cause or hospitalization due to CV events. Patients were divided into 5 categories based on their BMI: underweight <23.5 kg/m^2, normal weight 23.5-26.4 kg/m^2, overweight 26.5-30.9 kg/m^2, mild obesity 31.0-34.9 kg/m^2, and severe obesity >35.0 kg/m^2. Patients in the overweight category had the lowest rate of primary endpoint (33.1%), while the underweight group had the highest rate (49.1%). Patients in the underweight and normal weight groups had significantly higher rate of primary endpoint when compared to the overweight group (underweight *vs.* overweight: HR: 1.18; 95% CI: 1.03 to 1.36, $p=0.019$; normal weight *vs.* overweight: HR: 1.65; 95% CI: 1.38 to 1.97, $p<0.001$). After adjusting for 21 clinical variables (i.e. heart rate, ejection fraction, etc.), the rate of primary endpoint was significantly higher in the underweight (HR: 1.27; 95% CI: 1.04 to 1.56, $p=0.019$) and severely obese groups (HR: 1.27; 95% CI: 1.06 to 1.52, $p=0.011$). Increases in BMI were associated with lower unadjusted rates of sudden death and non-CV death [7].

Association between overweight and risks of developing HF was investigated in 5881 patients, who were enrolled in the Framingham Heart Study. Primary endpoint was the first episode of HF. After adjusting for risk factors such as age, smoking, alcohol usage, overweight and obese patients had significant increase in incidence of HF compared to the normal weight group (overweight *vs.* normal: HR: 1.34; 95% CI: 1.08-1.67; $p<0.007$; obese *vs.* normal: HR: 2.04; 95% CI: 1.59-2.63; $p<0.001$). When investigating individual gender group, no significance was found between normal weight and overweight male patients (HR: 1.2; 95% CI: 0.87-1.64; $p=0.27$) [8].

According to the studies evaluated, association between BMI and CV disease or CV mortality is controversial. Most of studies are retrospective, and may not have accounted for risks factors, such as family history, lifestyle, and comorbidities, that may have contributed

to the CV diseases. Additionally, for many studies, CV events were reported by patients on a voluntary basis, so severity and reliability of those events are uncertain. Interestingly, in the Post-hoc analysis of the I-PRESERVE trial, underweight patients had higher rates of CV events compared to the normal weight patients. Overall, maintaining a healthy lifestyle, while controlling CV risk factors, such as hypertension and diabetes, are essential in minimizing risks of CV events. Future studies should focus on identifying the optimal BMI range that is associated with the lowest risks for CV diseases.

References

1. Pi-Sunyer FX, Becker DM, Bouchard C (1998) Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults: the evidence report. NIH publication no: 98-4083 https://www.nhlbi.nih.gov/files/docs/guidelines/obesity_guidelines_archive.pdf.
2. DiPietro L, Mossberg HO, Stunkard AJ (1994) A 40-year history of overweight children in Stockholm: life-time overweight, morbidity, and mortality. Int J Obes 18: 585-90.
3. Flegal KM, Kit BK, Oprana H, Graubard BI (2013) Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. J Am Med Assoc 309: 71-82.
4. Abdulla J, Køber L, Abildstrøm SZ, Christensen E, James WPT, et al. (2008) Impact of obesity as a mortality predictor in high-risk patients with myocardial infarction or chronic heart failure: a pooled analysis of five registries. Eur Heart J 29: 594-601.
5. Shaper AG, Wannamethee SG, Walker M (1997) Body weight: implications for the prevention of coronary heart disease, stroke, and diabetes mellitus in a cohort study of middle aged men. BMJ 314: 1311–7.
6. Lawlor DA, Martin RM, Gunnell D (2006) Association of body mass index measured in childhood, adolescence, and young adulthood with risk of ischemic heart disease and stroke: findings from 3 historical cohort studies. Am J Clin Nutr 83: 767-73.
7. Haass M, Kitzman DW, Anand IS (2011) Body mass index and adverse cardiovascular outcomes in heart failure patients with preserved ejection fraction: results from the irbesartan in heart failure with preserved ejection fraction (I-PRESERVE) trial. Circ Heart Fail 4: 324-331.
8. Kenchaiah S, Evans JC, Levy D (2002) Obesity and the risk of heart failure. N Eng J Med 347: 305-313.