GAVIN PUBLISHERS

OPEN ACCESS

Journal of Surgery

Bezerra JAB, et al. J Surg 6: 1415.

DOI: 10.29011/2575-9760.001415

Opinion Article

Renal Function in Obese who Underwent Bariatric Surgery

Juliana Amaro Borborema Bezerra[1*], Carlos Teixeira Brandt[2], Daniel Mozart Bezerra Borborema[3], Fernanda Andréa Menezes Florêncio Maciel[4]

[1]Nephologist, PhD Student, Federal University of Pernambuco and Nephrologist of Federal University of Campina Grande, UFCG, Campina Grande, Paraíba, Brazil

[2]Scientific Director, UNIFACISA, Campina Grande,Paraíba, Brazil

[3]Medical Student,UNIFACISA, Campina Grande, Paraíba, Brazil

[4]Nutricionist, Paraíba Endoscopic and Obesity Surgery Institution, ICOEP, Campina Grande, Paraíba, Brazil

[*]**Corresponding author:** Juliana Amaro Borborema Bezerra,Nephologist, PhD Student, Federal University of Pernambuco and Nephrologist of Federal University of Campina Grande, UFCG, Campina Grande, Paraíba, Brazil

Citation: Bezerra JAB, Brandt CT, Borborema DMB, Maciel FAMF (2021) Renal Function in Obese who Underwent Bariatric Surgery. J Surg 6: 1415. DOI: 10.29011/2575-9760.001415

Received Date: 04 August, 2021; **Accepted Date:** 06 August, 2021; **Published Date**: 09 August, 2021

Key Points

- Impairment of renal function can occur in obese individuals with different metabolic body composition status and varies with gender, age and ethnic groups.
- The mechanism of chronic obesity contributing to Chronic Kidney Disease (CKD) remains elusive, multiple mechanisms had been proposed and include glomerular hyper filtration, development of micro albuminuria/proteinuria, increased glomerular capillary wall tension, and podocyte stress; these are followed by hypo filtration, decreased Glomerular Filtration Rate (GFR), and CKD progression.
- Medical or surgical loss of weight may be associated with improvement of renal function, however the subject is controversial.

Question Mark: Is bariatric surgery a good approach for the management of decreased renal function in obese patient?

Definitions

Obesity

WHO conceptualizes obesity as abnormal or excessive fat accumulation that may impair health. It is most commonly assessed using Body Mass Index (BMI), a simple and quick anthropometric tool that has a low cost. BMI $\geq$30 kg/m^2 is considered obesity. However, several researchers and professional associations consider the use of BMI as the primary clinical index of obesity insufficient. They have called for a new definition that fully accounts for the complexity of the disease relating to the quantity, distribution and secretory function of adipose tissue. Thus, other anthropometric markers are used for the purpose of better assessing obesity [1,2].

Renal Function/Obesity

The kidneys remove waste and extra water from the blood (as urine) and help keep ions (such as sodium, potassium, and calcium) balanced in the body. They also make hormones that help control blood pressure and stimulate bone marrow to make red blood cells. Kidney function is usually tested by measuring serum creatinine, and screening for glomerular disease is undertaken by measuring urine albumin or protein concentrations [3].

Obesity is associated with increasing prevalence of several diseases such as systemic arterial hypertension, diabetes and cardiovascular conditions, which can impair renal function. A general explanation is based on the micro vascular networks that are closely adapted to specific functions of nutrition and removal of waste in every organ. Damage of the small vessels in several tissues and organs has been reported in obesity and may increase cardio-renal risk. However, the mechanisms by which obesity and its attendant cardiovascular and metabolic consequences interact to cause renal micro vascular injury and chronic kidney disease are still unclear [4].

Epidemiology

Obesity is a global epidemic, affecting all age, race and ethnic groups. Nowadays, overweight and obesity represent over one third of the planet population. According to the WHO, in 2016 more than 650 million adults worldwide were obese. Obesity increases the risk for many chronic diseases, such as diabetes mellitus, cardiovascular diseases and cancers, and is possibly associated with mental health disorders. Thus, it is widespread in the world and can be a predictive factor for Chronic Kidney Disease (CKD), which may impair renal function. Additionally, it can lead to structural and inflammatory changes. These diseases are causing an enormous burden to human health and society [5-15].

Etiology

There is evidence suggesting that several factors play a role at different levels for the obese onset, including genetics, biology, human behavior, social interaction and broad environment at large [16-20]. Regarding to biological process, it includes sensibility to leptin and individual metabolism [21].

Individual behaviors include food intake choices and physical activities, while social interaction comprise family and friends connection that can influence life style. Regarding to environment it includes green spaces and suburb safety. Social forces are related to economy, politics, education self-perception of health and culture. All of these factors are direct or indirect associated with obesity [22] (Figure 1).

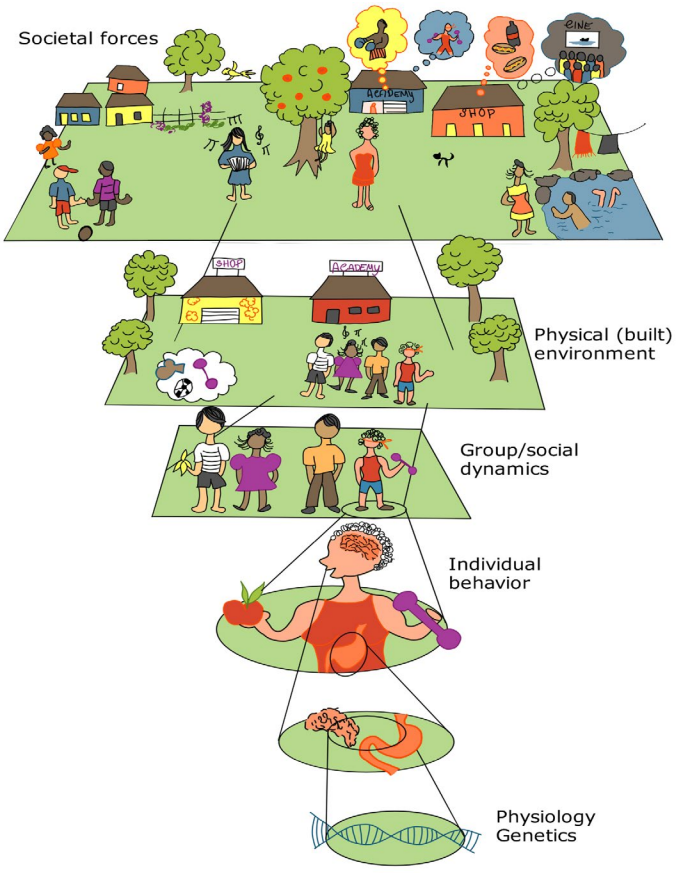

Figure 1: Illustration of how multiple factors acting across a range of scales can contribute to obesity.

Obesity and Renal Dysfuction: Physiopathology

The mechanisms of renal dysfunction in obese patients are not well clear (elusive). The studies in experimental animals offer mechanical insights on the changes over cardiovascular and renal systems. It has been observed expansion of extracellular fluid in obese, which in turn increases the renal blood flow [23]. Inflammations, oxidative stress and hyper activation of renin/angiotensin/aldosterone system, besides leptin and adipocin may play an important role in the physiopathology of renal dysfunction in obese patients [24-26]. One can observe increase renal sodium reabsorption, besides the recruitment of functional reserve with glomerular hyper filtration, Obesity can also promotes hypo filtration, increasing the risk for Chronic Kidney Disease (CKD) [24-33] (Figure 2).

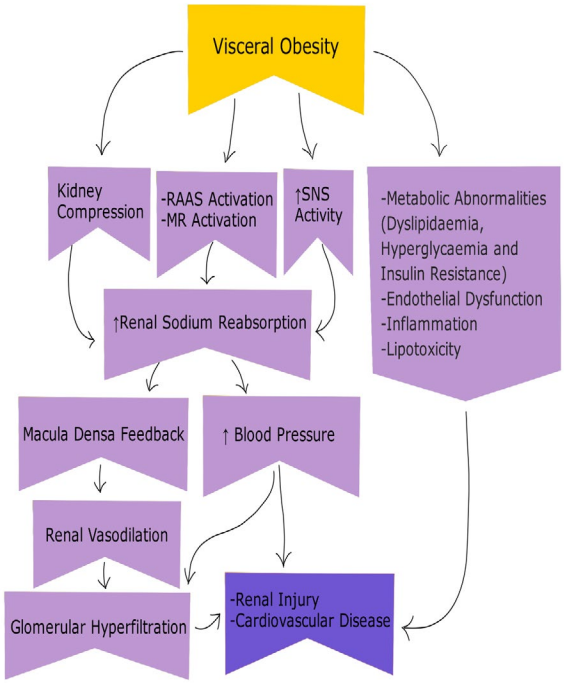

Figure 2: Mechanisms of obesity-induced hypertension, renal injury and cardiovascular disease.

Obesity Treatment Strategies - Bariatric Surgery

Aiming to reduce the risk of obesity and its morbidities, as well as improving life quality of these individuals several clinical and surgical approach have been used including change in life style, drugs and surgical interventions. Bariatric surgery has become the main operative way of controlling the associated morbidities, and an effective method for achieving sustained weight loss, improves blood pressure, reducing hyperglycemia, and even inducing diabetes remission [34-37] (Figure 3).

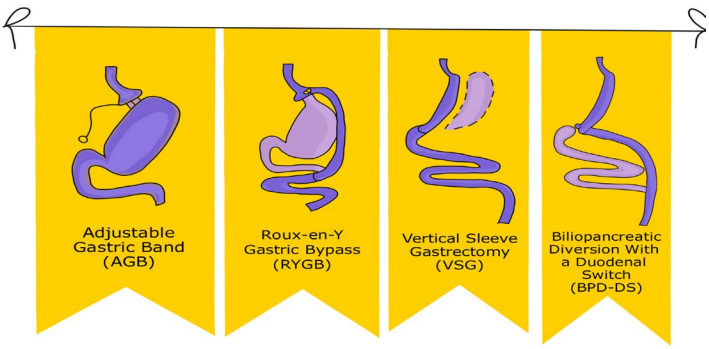

Figure 3: Diagram of surgical options. Image credit: Walter Pories, M.D. FACS.

Bariatric Surgery and Renal Function

The effect of bariatric surgery regarding the renal function is a subject of intensive research. In some papers one can observe, after this operative procedure, improvement of Glomerular Filtration Rate (GFR), reduction of hyper filtration and decrease in the micro albuminuria, preventing the onset of CKD and its progression. But in others this does not seem to be clear about the effect of bariatric surgery and improving kidney function[38-43]. Some studies sustain that there is a decrease in albuminuria after bariatric surgery due to a decrease in the intra-abdominal pressure, which in turn reduces the stress on the glomerular capillary wall preventing the onset of CKD [38-43]. Additionally, regarding renal function there is evidence that after bariatric surgery there improvement in the hypo filtration [44-50] or reduction of hyperfiltration [51,52]. On the other hand, there are studies that support no evidence of improvement of renal function after obese patient undergoing bariatric surgery, including worsening of renal function [53-55].

The use of more accurate biological markers, such as cystatin C, and more precise equations for estimating renal function in obese patients undergoing bariatric surgery one can improve more reliable assessment of renal function and its relationship of this surgical procedure in these patients [56,57]. Further prospective cohorts are required for providing better answer to the question whether there is improvement of renal funcion in obese patients undergoing bariatric surgery.

References

1. World Health Organization. Media Centre: Obesity and Overweight 2021.
2. Sommer I, Teufer B, Szelag M, Nussbaumer-Streit1 B, Titscher1 V, et al. (2020) The performance of anthropometric tools to determine obesity: a systematic review and meta-analysis. Sci Rep 10: 12699.
3. Feakins B, Oke J McFadden E, Aronson J, Lasserson D, O'Callaghan C, et al. (2019) Trends in kidney function testing in UK primary care since the introduction of the quality and outcomes framework: a retrospective cohort study using CPRD. BMJ Open 9.
4. Chade AR, Hall JE (2016) Role of renal microcirculation in progression of chronic kidney injury in obesity. Am J Nephrol 44: 354-367.
5. Hruby A, Hu FB (2015) The epidemiology of obesity: A big picture. Pharmacoeconomics 33: 673-689.
6. Inoue Y, Qin B, Poti J, Sokol R, Gordon-Larsen P (2018) Epidemiology of Obesity in Adults: Latest Trends. Curr Obes Rep 7: 276-288.
7. Bhupathiraju SN, Hu FB (2016) Epidemiology of Obesity and Diabetes and Their Cardiovascular Complications. Circ Res 118: 1723-1735.
8. Mohammed SH, Habtewold TD, Birhanu MM, Sissay TA, Tegegne BS, et al. (2019) Neighbourhood socioeconomic status and overweight/obesity: a systematic review and meta-analysis of epidemiological studies. BMJ Open 9: e028238.
9. Talukdar D, Seenivasan S, Cameron AJ, Sacks G (2020) The association between national income and adult obesity prevalence: Empirical insights into temporal patterns and moderators of the association using 40 years of data across 147 countries. PLoS One 15: e0232236.
10. Lee BY, Bartsch SM, Mui Y, Haidari LA, Spiker ML, et al. (2017) A systems approach to obesity. Nutr Rev 75: 94-106.
11. Rangel-Huerta OD, Pastor-Villaescusa B, Gil A (2019) Are we close to defining a metabolomic signature of human obesity? A systematic review of metabolomics studies. Metabolomics15: 93.
12. Jaacks LM, Vandevijvere S, Pan A, et al. (2019) The obesity transition: stages of the global epidemic. Lancet Diabetes Endocrinol 7: 231-240.
13. Mylona EK, Benitez G, Shehadeh F, et al. (2020) The association of obesity with health insurance coverage and demographic characteristics: a statewide cross-sectional study. Medicine (Baltimore) 99: e21016.
14. Pinto KRD, Feckinghaus CM, Hirakata VN (2021) Obesity as a predictive factor for chronic kidney disease in adults: systematic review and meta-analysis. Braz J Med Biol Res 54: e10022.
15. Hall JE, do Carmo JM, da Silva AA, Wang Z, Hall ME (2015) Obesity-induced hypertension: interaction of neurohumoral and renal mechanisms. Circ Res 116: 991-1006.
16. van der Valk ES, van den Akker ELT, Savas M, et al. (2019) A comprehensive diagnostic approach to detect underlying causes of obesity in adults. Obes Rev 20: 795-804.
17. Chiurazzi M, Cozzolino M, Orsini RC, Maro MD, Minno MND, et al. (2020) Impact of genetic variations and epigenetic mechanisms on the risk of obesity. Int J Mol Sci 21: 9035.
18. Alyssa T. Wilkins, Raylene A. Reimer (2021) Obesity, early life gut microbiota, and antibiotics. Microorganisms 9: 413.
19. Sigmund E, Dagmar Sigmundová D (2020) The relationship between obesity and physical activity of children in the spotlight of their parents excessive body weight. Int J Environ Res Public Health 17: 8737.
20. Jia P, Dai S, Rohli KE, Rohli RV, Ma Y, et al. (2021) Natural environment and childhood obesity: A systematic review. Obes Rev 22: e13097.
21. Zhu C, Jiang Z, Xu Y, Cai ZL, Jiang Q, et al. (2020) Profound and redundant functions of arcuate neurons in obesity development. Nat Metab 2: 763-774.
22. Reynolds JP, Vasiljevic M, Pilling M, Hall MG, Kurt M, et al. (2020) Communicating evidence about the causes of obesity and support for obesity policies: Two population-based survey experiments. Int J Environ Res Public Health 17: 6539.

23. McPherson KC, Shields CA, Poudel B, Fizer B, Pennington A, et al. (2019) Impact of obesity as an independent risk factor for the development of renal injury: implications from rat models of obesity. Am J Physiol Renal Physiol 316: F316.

24. Hall JE, Carmo JM, Silva AA, Wang Z, Hall ME (2019) Obesity, kidney dysfunction and hypertension: mechanistic links. Nat Rev Nephrol 15: 367-385.

25. Pazos F (2020) Range of adiposity and cardiorenal syndrome. World J Diabetes 11: 322-350.

26. Vahdat S (2018) The complex effects of adipokines in the patients with kidney disease. J Res Med Sci 23: 60.

27. Choi JI, Cho YH, Lee SY, Jeong DW, Lee JG, et al. (2019) The Association between Obesity Phenotypes and Early Renal Function Decline in Adults without Hypertension, Dyslipidemia, and Diabetes. Korean J Fam Med 40: 176-181.

28. Kovesdy CP, Furth SL, Zoccali C (2017) Obesity and kidney disease: hidden consequences of the epidemic. Braz J Med Biol Res 50: e6075.

29. Chade AR, Hall JE (2016) Role of the Renal Microcirculation in Progression of Chronic Kidney Injury in Obesity. Am J Nephrol 44: 354-367.

30. Chang AR, Surapaneni A, Kirchner HL, Young A, Kramer HJ, et al. (2018) Metabolically Healthy Obesity and Risk of Kidney Function Decline. Obesity (Silver Spring) 26: 762-768.

31. Xu T, Sheng Z, Yao L (2017) Obesity-related glomerulopathy: pathogenesis, pathologic, clinical characteristics and treatment. Front Med : 340-348.

32. Garofalo C, Borrelli S, Minutolo R, Chiodini P, De Nicola L, et al. (2017) A systematic review and meta-analysis suggests obesity predicts onset of chronic kidney disease in the general population. Kidney Int 91: 1224-1235.

33. Pinto KRD, Feckinghaus CM, Hirakata VN (2021) Obesity as a predictive factor for chronic kidney disease in adults: systematic review and meta-analysis. Braz J Med Biol Res 54: e10022.

34. Wolfe BM, Kvach E, Eckel RH (2016) Treatment of Obesity: Weight Loss and Bariatric Surgery. Circ Res 118: 1844-1855.

35. Ovrebo B, Strommen M, Kulseng B, Martins C (2017) Bariatric surgery versus lifestyle interventions for morbid obesity - Changes in body weight, risk factors and comorbidities at 1 year. Obesity Surgery 21: 841-849.

36. Borisenko O, Mann O, Duprée A (2017) Cost-utility analysis of bariatric surgery compared with conventional medical management in Germany: a decision analytic modeling. BMC Surg 17: 87.

37. Martin WP, White J, López-Hernández FJ, Docherty NG, le Roux CW (2020) Metabolic Surgery to Treat Obesity in Diabetic Kidney Disease, Chronic Kidney Disease, and End-Stage Kidney Disease; What Are the Unanswered Questions?. Front Endocrinol (Lausanne) 11: 289.

38. Martin WP, Docherty NG, Le Roux CW (2018) Impact of bariatric surgery on cardiovascular and renal complications of diabetes: a focus on clinical outcomes and putative mechanisms. Expert Rev Endocrinol Metab 13: 251-262.

39. Carlsson LM, Romeo S, Jacobson P, Burza MA, Maglio C, et al. (2015) The incidence of albuminuria after bariatric surgery and usual care in Swedish Obese Subjects (SOS): a prospective controlled intervention trial. Int J Obes (Lond) 39: 169-175.

40. Chang AR, Chen Y, Still C, Wood GC, et al. (2016) Bariatric surgery is associated with improvement in kidney outcomes. Kidney Int 90: 164-171.

41. Chang AR, Grams ME, Navaneethan SD (2017) Bariatric surgery and kidney-related outcomes. Kidney Int Rep 2: 261-270.

42. Cohen JB, Tewksbury CM, Torres Landa S, Williams NN, Dumon KR (2019) National Postoperative Bariatric Surgery Outcomes in Patients with Chronic Kidney Disease and End-Stage Kidney Disease. Obes Surg 29: 975-982.

43. Friedman AN, Wahed AS, Wang J, Courcoulas AP, Dakin G, et al. (2018) Effect of Bariatric Surgery on CKD Risk. J Am Soc Nephrol 29: 1289-1300.

44. Lin YC, Lai YJ, Lin YC, Peng CC, Chen KC, et al. (2019) Effect of weight loss on the estimated glomerular filtration rates of obese patients at risk of chronic kidney disease: the RIGOR-TMU study. J Cachexia Sarcopenia Muscle 10: 756-766.

45. Holcomb CN, Goss LE, Almehmi A, Grams JM, Corey BL (2017) Bariatric surgery is associated with renal function improvement. Surgical Endoscopy 32: 276-281.

46. Bjornstad P, Nehus E, van Raalte D (2020) Bariatric surgery and kidney disease outcomes in severely obese youth. Semin Pediatr Surg 29: 150883.

47. Lin YC, Lai YJ, Lin YC, Peng CC, Chen KC, et al. (2019) Effect of weight loss on the estimated glomerular filtration rates of obese patients at risk of chronic kidney disease: the RIGOR-TMU study. J Cachexia Sarcopenia Muscle 10: 756-766.

48. Favre G, Schiavo L, Lemoine S, Esnault VLM, Iannelli A (2018) Longitudinal assessment of renal function in native kidney after bariatric surgery. Surgery for Obesity and Related Diseases 19: 10.

49. Coupaye M, Flamant M, Sami O, Calabrese D (2016) Determinants of Evolution of Glomerular Filtration Rate After Bariatric Surgery: a 1-Year Observational Study. Obes Surgery.

50. Li K, Zou J, Ye Z, Di J, Han X, et al. (2016) Effects of Bariatric Surgery on Renal Function in Obese Patients: A Systematic Review and Meta Analysis. PLoS One 11: e0163907.

51. Coupaye M, Flamant M, Sami O, Calabrese D, Msika S, et al. (2017) Determinants of evolution of glomerular filtration rate after bariatric surgery: a 1-year observational study. Obes Surg 27: 126-133.

52. Clerte M, Wagner S, Carette C, Brodin-Sartorius A, Vilaine E, et al. (2017) The Measured Glomerular Filtration Rate (mGFR) before and 6 months after bariatric surgery: A pilot study. Néphrologie & Thérapeutique 13: 160-167.

53. Chuah LL, Miras AD, Perry LM, Frankel AH, Towey DJ, et al. (2018) Measurement of glomerular filtration rate in patients undergoing obesity surgery. BMC Nephrology 19: 383.

54. Scholten BJV, Persson F, Svane MS, Hansen TW, Madsbad S, et al. (2017) Effect of large weight reductions on measured and estimated kidney function. BMC Nephrology 18: 52.

55. Kim EY, Kim YJ (2016) Does bariatric surgery really prevent deterioration of renal function? Surg Obes Relat Dis 12: 856-861.

56. Ji M, Lee YH, Hur M, Kim H, Cho HI, et al. (2016) Comparing results of five glomerular filtration rate-estimating equations in the Korean general population: MDRD study, revised Lund-Malmo, and three CKD-EPI equations. Ann Lab Med 36: 521-528.

57. Kumar BV, Mohan T (2017) Retrospective Comparison of Estimated GFR using 2006 MDRD, 2009 CKD-EPI and Cockcroft-Gault with 24 Hour Urine Creatinine Clearance. Journal of Clinical and Diagnostic Research 11: 10-13.