Association between ethnicity and changes in weight, blood pressure, blood glucose and lipid levels after bariatric surgery: a systematic review protocol

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Review question: What is the association between ethnicity and changes in weight, blood pressure, blood glucose and lipid levels after bariatric surgery?

Keywords Bariatric surgery; comorbidity; ethnicity; obesity; weight loss


Introduction

Obesity and bariatric surgery

Obesity, defined as a body mass index (BMI) of > 30 kg/m², has escalated into a significant chronic disease in the United States (US) over the past few decades, as more than two-thirds of the population has been labeled as overweight or obese.¹² Obesity occurs in higher numbers in minority populations in the US. Significantly, 21.9% of African American adults and 15.5% of Hispanics are obese in comparison to 13.6% of Caucasians in the US.³ The increasing obesity trend is not limited to the US. In 1975, there were an estimated 105 million obese adults worldwide; however, by 2014 the number increased to an estimated 641 million obese adults worldwide.⁴ Interestingly, 27.1% of obese adults are found in high-income English speaking countries, while 13.9% of the severely obese live in the Middle East and North Africa.⁴ Hayes et al.³ reported 27.9% of the adult Australian population was obese. Kuwait has an alarmingly high prevalence of adult obesity at 79.5%.⁶

Obesity designations are defined differently for some populations. The World Health Organization (WHO) classifies a BMI of > 25 kg/m² as obesity in Asians because they have a larger waist circumference and waist to hip ratio, known as central obesity, and are predisposed to a higher body fat percentage than other races.⁷ During a 2014 regional study, researchers within the Non-communicable Diseases Risk Factor Collaboration found the mean BMI for Polynesian and Micronesian men to be 29.2 kg/m² and to be 32.2 kg/m² for women.⁴ Between 1978 and 2013, the prevalence of obesity in Samoa increased from 27.7% to 53.1% in men and from 44.4% to 76.7% in women.⁸ Rapidly rising obesity rates around the world will have an increasingly detrimental impact on health, healthcare costs, and the supply and demand of healthcare providers.

Obesity has been linked with multiple interrelated factors, such as a sedentary lifestyle of little or no exercise. A cycle emerges as sedentary lifestyles have been interrelated to the increase in urbanization, which in turn, has been linked to increased consumption of soft drinks and energy-dense diets consisting of added sugar and high fat foods.⁹ The impact on health has also been clear with a link to the increase in chronic disease processes. Obesity results in increased incidence of cardiovascular disease, stroke, diabetes, several forms of cancer, and 50% to 100% increased morbidity and mortality compared to people who maintain a healthy weight.¹ The increased incidence of chronic diseases is partly due to excess adipose tissue formed in overweight and obese people which leads to increased occurrences of type 2 diabetes, hyperlipidemia and hypertension.¹⁰ Excess adipose tissue leads to impaired insulin resistance and can cause type 2 diabetes. There is increased lipid production
leading to higher numbers of free fatty acids that can cause hyperlipidemia. Increased adiposity leads to increased activity in both the sympathetic nervous and renin-angiotensin-aldosterone systems causing hypertension. Hypertension can result from renal compression caused by pressure from increased visceral adiposity surrounding the kidneys. Overweight and obesity has led to four million deaths worldwide with more than two thirds of those deaths resulting from cardiovascular disease. Obesity has also been found to be the leading cause of preventable and premature death in the Western World and the US and in the US it accounts for healthcare costs 25% higher than non-obese people. In 2013, US federal health programs paid close to USD29 billion in obesity-related healthcare costs. Obesity-related direct and indirect healthcare costs in Australia in 2005 were an estimated AUD21 billion. In the United Kingdom, approximately £3.2 billion to £4.2 billion was used for obesity-related healthcare costs in 2009. In Canada in 2009, the estimated direct and indirect healthcare costs related to obesity were CAD10.96 billion. The direct and indirect obesity-related healthcare costs in Germany in 2009 were €9,873 billion.

Worldwide, bariatric surgery for obesity has been found to be the treatment with longest lasting effects. It involves surgically altering the gastrointestinal tract to assist in weight loss. The three main types of bariatric surgery are gastric bypass, sleeve gastrectomy (SG), and adjustable gastric band (AGB). Gastric bypass or Roux-en-Y gastric bypass (RYGB) is considered the gold standard of bariatric surgery. Surgeons create a small pouch at the top of the stomach and then, the jejunum is connected to the pouch via a small hole. The sleeve gastrectomy decreases the size of the stomach by approximately 75% through surgical removal of the greater curvature of the stomach. In gastric banding, a thin, inflatable band is surgically placed around the top of the stomach to create a smaller stomach pouch. Estimated weight loss after bariatric surgery for AGB, RYGB, and SG has been found to be greater than 50% for either procedure at long-term follow-up of at least five years after surgery.

Bariatric surgery has also been found to be the most cost-effective treatment for obesity. Unfortunately, comparisons across countries are difficult because healthcare and payment systems are not the same. In a recent study of the cost of bariatric surgeries in the US, the median calculated cost for RYGB was USD12,543; SG was USD10,531; and AGB was USD9219. In the United Kingdom, the cost for SG and AGB was USD5771 and RYGB was USD6602. The cost for RYGB in Brazil was USD9191.

Race, ethnicity, and co-morbidities

Within the scientific community, definitions of race and ethnicity have not been clearly delineated. According to Stryjecki et al., race represents a population according to shared biological characteristics like skin color and hair type, while ethnicity describes cultural characteristics like religious affiliation and language. Ethnicity has been broadly defined by Ford and Harawa as a multifactorial concept that encompasses not only sociocultural characteristics, such as, shared culture and the way of life of a group of people, but also relational characteristics, including, social stratification and exposure within society. This definition is used for the purpose of this review. Because higher rates of obesity are seen in Caucasians, Hispanics, those of African descent and Asians, these groups will be the focus of this review. As indicated earlier, obesity is positively linked to conditions such as heart disease, diabetes and stroke; therefore, hypertension (HTN), diabetes mellitus (DM), and hyperlipidemia (HLD) will be included in this review. Changes in glycated hemoglobin (HbA1c), blood pressure, cholesterol, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) will be assessed from baseline and up to five years after surgery. In a study by Shah et al. evaluating Asians after bariatric surgery, the pre-surgery HbA1c was 10.1, and nine months after bariatric surgery HbA1c was down to 6.1. In the same study, baseline mean systolic blood pressure was 136mmHg. At the follow-up at nine months, the mean systolic blood pressure was 116mmHg. Mean total cholesterol prior to surgery was 175 mg/dL, and after bariatric surgery the mean total cholesterol was 135 mg/dL. The mean pre-surgery BMI was 28.9 kg/m², and after bariatric surgery, the mean BMI was 23.0 kg/m². Researchers evaluating people of African descent, Caucasians, and Hispanics found the pre-surgery mean BMI for people of African descent was 48.5 kg/m², Hispanics 46.2 kg/m², and Caucasians 46.6 kg/m². Two years after bariatric surgery, the
mean BMI for people of African descent was 24 kg/m², Hispanics 30.3 kg/m², and Caucasians 30.3 kg/m². In a 2012 meta-analysis by Admiraal et al., pooled data on 1087 people of African descent and 2714 Caucasians found a mean difference of −8.39% significantly in favor of Caucasians with a 95% confidence interval (CI) of −10.7 to −5.93. This study also found no significant statistical difference in the improvement in DM between people of African descent and Caucasians with a CI of 1.41 out of a 95% CI of 0.56 to 3.52.

Weight loss after bariatric surgery ranges from 20% to 35% of baseline weight one to two years after the procedure. For this review, weight loss is defined as the difference between baseline weight and weight up to five years after bariatric surgery. Studies show mixed results in regard to the above-mentioned outcomes and ethnicity. Caucasians and Hispanics have been found to have significantly higher weight loss after bariatric surgery than people of African descent, with 65% estimated weight loss in two years in comparison to 55% estimated weight loss for people of African descent in the same time frame. Asians have been found to have greater estimated weight loss than Caucasians and people of African descent with 62% weight loss at three years after procedure compared to 45% for Caucasians and 39% for people of African descent. A study among African, Asian, Turkish and Moroccan people suggested people of African descent lose less weight because of lower socioeconomic factors.

Finding an association

Given the varying results in outcomes in different ethnicities after bariatric surgery reported in the literature, further review and synthesis of evidence is warranted to determine if there is an association. This study has the potential to impact practice because providers will be able to provide realistic outcome expectations to people of different ethnic backgrounds undergoing bariatric surgery. If racial disparities are found among the results, providers will have the opportunity to implement initiatives like individualized diet and exercise regimens postoperatively in order to help improve outcomes for different ethnicities. An initial preliminary search conducted in July 2018 of PubMed, Cochrane Database of Systematic Reviews, JBI Database of Systematic Reviews and Implementation Reports, Scopus, PROSPERO, Campbell, and CINAHL did not identify any systematic reviews on this topic. While there is a meta-analysis by Admiraal et al. that focuses on Caucasians and African Americans with diabetes, this review will be more extensive, including a broader population and more co-morbidities. The objective of this review is to determine the association between ethnicity and outcomes after bariatric surgery. The specific outcomes are weight, blood pressure, blood glucose and lipid levels.

Inclusion criteria

Participants

This review will consider studies that include obese adults 18 years of age and over who are of African, Caucasian or Hispanic descent with a BMI > 30 kg/m² or Asian with a BMI > 25 kg/m². People of African descent are described as persons having origins in any of the black racial groups of Africa. Caucasians are people who are descendants from Europe, the Middle East or North Africa. Hispanics are described as a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture. Asians are defined as any person descending from Far East Asia, Southeast Asia or the Indian subcontinent including Pakistan, Sri Lanka, Bangladesh, Cambodia, China, Japan, India, Korea, Malaysia, the Philippine Islands, Thailand and Vietnam.

Exposure

The exposure evaluated in this review will be bariatric surgery, specifically laparoscopic Roux-en-Y gastric bypass, sleeve gastrectomy and adjustable gastric band.

Outcomes

The outcomes evaluated in this review will be weight change and changes in blood pressure, blood glucose and lipid levels occurring from one month to five years following bariatric surgery. Weight will be measured by a change in weight, as indicated by pounds, kilograms or BMI. Blood pressure will be measured by changes in systolic and diastolic blood pressure in millimeters of mercury (mmHg). Blood glucose will be measured by changes in HbA1c. Lipid levels will be measured by changes in total cholesterol, HDL, LDL and triglycerides.
Types of studies
Analytical observational studies including retrospective, prospective, cross-sectional, longitudinal cohort studies or case-control studies will be considered for inclusion. This review will also consider descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion. Studies published in English will be included. Studies from 2005 to the present will be included in the review, as significant advancements using laparoscopy in bariatric surgery were made in 2005, therefore studies on bariatric surgery using open surgery will be excluded.

Methods
The JBI methodology will be used to complete this association review.

Search strategy
The search strategy will aim to find both published and unpublished studies. An initial limited search of MEDLINE, via PubMed and CINAHL, has been undertaken to identify articles on this topic, followed by analysis of the text words contained in the titles and abstracts, and of the index terms used to describe these studies. This informed the development of a search strategy which will be tailored for each information source. A proposed search strategy for PubMed is detailed in Appendix I.

Information sources
The databases to be searched include: CINAHL – EBSCOhost, Cochrane Central Register of Controlled Trials – EBSCOhost, Embase, PubMed – NCBI (National Center for Biotechnology Information), and Scopus.

The search for unpublished studies will include: MedNar, ProQuest Nursing and Allied Health Source (Dissertations and Theses), and government website: WHO (www.who.int)

Study selection
Following the search, all identified citations will be collated and uploaded into EndNote (Clarivate Analytics, PA, USA) and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Studies that may meet the inclusion criteria will be retrieved in full and their details imported into Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information (JBI SUMARI) (Joanna Briggs Institute, Adelaide, Australia). The full text of selected studies will be retrieved and assessed in detail against the inclusion criteria. Full text studies that do not meet the inclusion criteria will be excluded and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will undergo a process of critical appraisal. The results of the search will be reported in full in the final report and presented in a PRISMA flow diagram. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

Assessment of methodological quality
All selected studies will be critically appraised independently by two reviewers at the study level for methodological quality in the review using standardized critical appraisal instruments from Joanna Briggs Institute for the following study types: analytical observational studies including retrospective, prospective, cross-sectional, longitudinal cohort studies or case-control studies; and descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. Studies of poor methodological quality will be excluded. The review will only include studies that have been appraised at a moderate or high quality. A study will be considered of moderate or high quality if the reviewers answer “yes” to six or more questions in the appraisal tool. If the reviewers answer “yes” to five questions or less, the study will be considered poor quality and will not be included.

Data extraction
Data will be extracted from papers included in the review using the standardized data extraction tools in JBI SUMARI by two independent reviewers. The data extracted will include specific details about the exposure of interest including different exposure categories if applicable, populations, study methods and outcomes or dependent variables of significance to the review question and specific objectives. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. Authors of
papers will be contacted to request missing or additional data where required.

**Data synthesis**

Findings of paper will be pooled in a statistical meta-analysis using JBI SUMARI when possible. Effect sizes will be expressed as relative risk for cohort studies, odds ratios for case-control studies (for categorical data) and descriptive parametric and non-parametric statistics for cross-sectional analytical studies with 95% CIs calculated for analysis. Heterogeneity will be assessed statistically using the standard chi-squared and I squared tests. The choice of model (random or fixed effects) and method for meta-analysis will be based on the guidance by Tufunaru et al. 2015.

Subgroup analyses will be conducted where there is sufficient data to investigate the lipid profile including HDL, LDL, cholesterol and triglycerides; HbA1c in relation to blood glucose; and weight changes including BMI. Sensitivity analysis will be conducted to test decisions made regarding the association of ethnicity with changes in weight, blood pressure, blood glucose and lipid levels within five years after bariatric surgery. Where statistical pooling is not possible, the findings will be presented in narrative form with tables and figures to aid in data presentation and interpretation where appropriate.

A funnel plot will be generated within JBI SUMARI to assess publication bias if there are 10 or more studies included in a meta-analysis. Statistical tests for funnel plot asymmetry (Egger test, Begg test, Harbord test) will be performed where appropriate.

**Assessing certainty in the findings**

A Summary of Findings will be created using GRADEPro GDT software (McMaster University, ON, Canada). The GRADE approach for grading the quality of evidence will be followed. The Summary of Findings will present the following information where appropriate: absolute risks for treatment and control, estimates of relative risk, and a ranking of the quality of the evidence based on study limitations (risk of bias), indirectness, inconsistency, imprecision and publication bias.

The following outcomes will be included in the Summary of Findings: weight, blood pressure, blood glucose and lipid levels

**References**

Appendix I: Search strategy for PubMed


4. “Comorbidity”[MeSH] OR “Hypertension” OR “High blood pressure” OR “Blood pressure” OR “Hyperlipidemia” OR “Dyslipidemia” OR “Hypertriglyceridemia” OR “Hypercholesterolemia” OR “Diabetes Mellitus”

5. “Weight loss”[MeSH] OR “weight reduction” OR “weight change”

6. #1 AND #2 AND #3 AND #4 AND #5

7. (Limits: Publications from January 2005)