SYSTEMATIC AND META-ANALYSIS

https://doi.org/10.61910/ricm.v8i2.436

Prevalence of sarcopenia after bariatric surgery: a systematic review and meta-analysis of observational studies

Prevalência de sarcopenia após cirurgia bariátrica: Uma revisão sistemática e meta-análise de estudos observacionais

SUPPLEMENTARY INFORMATION (SI)

Table S1. Indexers used to select publications.

PubMed **321**	("bariatric surgery"[Mesh Terms] or "bariatric surgery"[Text Word] or "surgeries bariatric"[All Fields] or "surgery bariatric"[All Fields] or "Metabolic Surgery"[All Fields] or "Metabolic Surgeries"[All Fields] or "surgeries metabolic"[All Fields] or "surgery metabolic"[All Fields] or "Bariatric Surgical Procedures"[All Fields] or "Bariatric Surgical Procedure"[All Fields] or ("bariatric surgery"[Mesh Terms] or ("bariatric"[All Fields] and "surgery"[All Fields]) or "bariatric surgery"[All Fields] or ("procedure"[All Fields] and "bariatric"[All Fields] and "surgical"[All Fields])) or ("bariatric surgery"[Mesh Terms] or ("bariatric"[All Fields] and "surgery"[All Fields]) or "bariatric surgery"[All Fields] or ("procedures"[All Fields] and "bariatric"[All Fields] and "surgical"[All Fields])) or "surgical procedure bariatric"[All Fields] or "surgical procedures bariatric"[All Fields] or "Bariatric Surgeries"[All Fields] or "Stomach Stapling"[All Fields] or ("bariatric surgery"[Mesh Terms] or ("bariatric"[All Fields] and "surgery"[All Fields]) or "bariatric surgery"[All Fields] or ("stapling"[All Fields] and "stomach"[All Fields])) or "Bariatrics"[Mesh Terms]) and ("Sarcopenia"[Mesh Terms] or "Sarcopenia"[Text Word] or "Sarcopenias"[All Fields] or "Muscle Weakness"[Mesh Terms] or "Muscle Weakness"[Text Word] or "Muscle Weaknesses"[All Fields] or "weakness muscle"[All Fields] or ("Muscle Weakness"[Mesh Terms] or ("muscle"[All Fields] and "weakness"[All Fields]) or "Muscle Weakness"[All Fields] or ("weaknesses"[All Fields] and "muscle"[All Fields])) or "Muscular Weakness"[All Fields] or "Muscular Weaknesses"[All Fields] or "weakness muscular"[All Fields] or ("Muscle Weakness"[Mesh Terms] or ("muscle"[All Fields] and "weakness"[All Fields]) or "Muscle Weakness"[All Fields] or ("weaknesses"[All Fields] and "muscular"[All Fields])) or "Muscle Strength"[Mesh Terms] or "Muscle Strength"[Text Word] or "strength muscle"[All Fields] or "lean mass"[All Fields] or "skeletal muscle index"[All Fields] or "low muscle"[All Fields])
BVS = LILACS e BDENF **30**	("Cirurgia Bariátrica" or "bariatric surgery" or "Cirugía Bariátrica" or "Bariatria" or "Bariatrics") and ("Sarcopenia" or "Debilidade Muscular" or "Muscle Weakness" or "Debilidad Muscular" or "Força Muscular" or "Muscle Strength" or "Fuerza Muscular" or "lean mass" or "skeletal muscle index" or "low muscle") and (db:("lilacs" or "bdenf"))
Embase **2882**	#1 'bariatric surgery'/exp or 'bariatric surgery'/syn or 'bariatrics'/exp or 'bariatrics'/syn #2 'sarcopenia'/exp or 'sarcopenia'/syn or 'muscle weakness'/exp or 'muscle weakness'/syn or 'muscle strength'/exp or 'muscle strength'/syn #3 #1 and #2
Web of Science **212**	#1 bariatric surgery or bariatrics #2 sarcopenia or muscle weakness or muscle strength https://www.webofscience.com/wos/woscc/summary/9f015ce9-0534-4d1f-a31d-206d97903732-99c0c2f9/relevance/1

Table S2. JBI Critical Appraisal Checklist (Risk of Bias)

Author (year)	1	2	3	4	5	6	7	8	9
Carvalho et al., 2023	Y	N	N	Y	Y	Y	Y	Y	U
Khitaryan et al., 2021	Y	N	N	Y	Y	Y	Y	U	U
Maimoun et al., 2019	Y	N	N	Y	Y	Y	Y	Y	U
Pekar et al., 2020	Y	N	N	Y	Y	Y	Y	Y	U
Santarpia et al., 2021	Y	N	N	Y	Y	Y	Y	U	U
Speranza et al., 2020	Y	N	N	Y	Y	Y	Y	U	U
Vassilev et al., 2022	Y	N	N	Y	Y	Y	Y	Y	U
Voican et al., 2018	Y	N	N	Y	Y	Y	Y	Y	U
Total:	**Yes : 62,5%**		**No: 22,2%**		**Unclear: 15,3%**		**Not Applicable: 0%**		

Questions: 1. Was the sample frame appropriate to address the target population?; **2.** Were study participants sampled in an appropriate way?; **3.** Was the sample size adequate?; **4.** Were the study subjects and the setting described in detail?; **5.** Was the data analysis conducted with sufficient coverage of the identified sample?; **6.** Were valid methods used for the identification of the condition?; **7.** Was the condition measured in a standard, reliable way for all participants?; **8.** Was there appropriate statistical analysis?; **9.** Was the response rate adequate, and if not, was the low response rate managed appropriately?

Table S3. Full-text excluded articles and reasons.

Author (year)	Title	Exclusion Motif
Adamczyk et al., 2015	Body Size, Bone Mineral Density, and Body Composition in Obese Women After Laparoscopic Sleeve Gastrectomy: A 1-Year Longitudinal Study.	1
Adib et al., 2015	Beneficial effects of home-based and supervised exercise programs on anthropometric indices, body composition, and aerobic capacity in obese patients who undergoing laparoscopic gastric bypass surgery	1
Alba et al., 2019	Changes in Lean Mass, Absolute and Relative Muscle Strength, and Physical Performance after Gastric Bypass Surgery	1
Andrade et al., 2018	Baseline Pro-Inflammatory Diet Is Inversely Associated with Change in Weight and Body Fat 6 Months Following-up to Bariatric Surgery.	1
André et al., 2020	Whole-body electrical stimulation as a strategy to improve functional capacity and preserver lean mass after bariatric surgery: a randomized triple-blind controlled trial	1
Bazzocchi et al., 2014	Visceral fat and body composition changes in a female population after RYGBP: a two-year follow-up by DXA.	1
Beamish et al., 2017	Body composition and bone health in adolescents after Roux-en-Y gastric bypass for severe obesity.	1
Bellicha et al., 2020	Exercise training and protein supplementation RCT after bariatric surgery: A 5-year follow-up study	1
Bellicha et al., 2022	Effect of exercise training after bariatric surgery: A 5-year follow-up study of a randomized controlled trial	1
Campanha-Versiani et al., 2017	The Effect of a Muscle Weight-Bearing and Aerobic Exercise Program on the Body Composition, Muscular Strength, Biochemical Markers, and Bone Mass of Obese Patients Who Have Undergone Gastric Bypass Surgery	1
Cogollo et al., 2021	Improvement of glucose metabolism following rapid weight loss after bariatric surgery and its impact on reduction of visceral abdominal fat versus free fat muscle.	1
Cole et al., 2017	Long-Term Body Composition Changes in Women Following Roux-en-Y Gastric Bypass Surgery.	1

Daniels et al., 2017	Effect of a randomised 12-week resistance training programme on muscular strength, cross-sectional area and muscle quality in women having undergone Roux-en-Y gastric bypass	1
Di Lorenzo et al., 2014	Evaluation and prevention of lean body mass loss following bariatric surgery	1
Dubnov-Raz et al., 2016	Body composition changes in adolescents after laparoscopic sleeve gastrectomy	1
Earthman et al., 2019	An evaluation of phase angle, impedance ratio, and bioimpedance vector for assessing body composition and clinical outcomes in gastric bypass patients	1
Fonseca et al., 2018	Short term effects of bariatric surgery on balance control and fall risk of obese patients	1
Garciacaballero et al., 2014	Changes of Body Composition in Patients with BMI 23-50 After Tailored One Anastomosis Gastric Bypass (BAGUA): Influence of Diabetes and Metabolic Syndrome	1
Gunes et al., 2019	The Impact of Protein Support on Weight Loss, Sarcopenia, and Quality of Life after Sleeve Gastrectomy	1
Hassannejad et al., 2017	The Effect of Aerobic or Aerobic-Strength Exercise on Body Composition and Functional Capacity in Patients with BMI ≥35 after Bariatric Surgery: a Randomized Control Trial	1
Hirsch et al., 2020	Provision of ready-to-drink protein following bariatric surgery: An evaluation of tolerability, body composition, and metabolic rate	1
Huck C.J. (2015)	Effects of supervised resistance training on fitness and functional strength in patients succeeding bariatric surgery	1
In et al., 2021	Comparison of 12-Week Fitness Protocols Following Bariatric Surgery: Aerobic Exercise Versus Aerobic Exercise and Progressive Resistance	1
Irribarra et al., 2015	Global and segmental body composition changes of patients in medical and surgical treatment for the reduction of body weight	1
Karihaloo et al., 2013	Body Composition After Sleeve Gastrectomy	1
Kavanagh et al., 2019	A Comparison of the Effects of Roux-en-Y Gastric Bypass and Sleeve Gastrectomy on Body Mass Composition as Measured by Air Displacement Plethysmography	1
Lee et al., 2021	Comparison of Bioelectrical Impedance Analysis and Computed Tomography on Body Composition Changes Including Visceral Fat After Bariatric Surgery in Asian Patients with Obesity.	1
Marengo et al., 2017	Is Trabecular Bone Score Valuable in Bone Microstructure Assessment after Gastric Bypass in Women with Morbid Obesity?	1
Miller et al., 2009	Physical function improvements after laparoscopic Roux-en-Y gastric bypass surgery.	1
Mundbjerg et al., 2018	Effects of 6 months supervised physical training on muscle strength and aerobic capacity in patients undergoing Roux-en-Y gastric bypass surgery: a randomized controlled trial	1
Nguyen et al., 2022	Fat-Free Mass and Skeletal Muscle Mass Gain Are Associated with Diabetes Remission after Laparoscopic Sleeve Gastrectomy in Males but Not in Female.	1
Ninõ et al., 2019	Cambios en la densidad mineral ósea y en la composición corporal en pacientes obesos sometidos a cirugía bariátrica	1
Oliveira et al., 2022	Resistance training improves muscle strength and function, regardless of protein supplementation, in the mid-to long-term period after gastric bypass	1
Oppert el al., 2017	Effect of resistance exercise training on body composition and physical ftness after gastric bypass (PROMISE study)–A randomized controlled trial	1
Oppert et al., 2018	Resistance Training and Protein Supplementation Increase Strength After Bariatric Surgery: A Randomized Controlled Trial	1
Otto et al., 2014	Handgrip Strength as a Predictor for Post Bariatric Body Composition	1
Raftopoulos et al., 2011	Protein intake compliance of morbidly obese patients undergoing bariatric surgery and its effect on weight loss and biochemical parameters.	1
Reinmann et al., 2020	Bariatric Surgery: Consequences on Functional Capacities in Patients With Obesity	1

Santos et al., 2023	A dataset on skeletal muscle mass index, body composition and strength to determinate sarcopenia in bariatric patients.	1
Schneider et al., 2016	Laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass lead to equal changes in body composition and energy metabolism 17 months postoperatively: a prospective randomized trial	1
Schollenberger et al., 2016	Impact of protein supplementation after bariatric surgery: A randomized controlled double-blind pilot study.	1
Shah et al., 2021	Anthropometrics by Three-Dimensional Photonic Scanner in Patients with Obesity Before and After Bariatric Surgery.	1
Smelt et al., 2019	Assessment of Physical Fitness after Bariatric Surgery and Its Association with Protein Intake and Type of Cholecalciferol Supplementation	1
Stegen et al., 2009	Physical fitness in morbidly obese patients: Effect of gastric bypass surgery and exercise training	1
Stolberg et al., 2015	Structured, supervised physical training after gastric bypass has positive impact on weight reduction and aerobic capacity	1
Tamboli et al., 2010	Body composition and energy metabolism following Roux-en-Y gastric bypass surgery.	1
Tizmaghz et al., 2022	Changes in Body Composition, Basal Metabolic Rate, and Blood Albumin during the First Year following Laparoscopic Mini-Gastric Bypass.	1
Varma et al., 2019	Comparative Effects of Medical Versus Surgical Weight Loss on Body Composition: a Pilot Randomized Trial.	1
Vilarrasa et al., 2010.	Evaluation of bone mineral density loss in morbidly obese women after gastric bypass: 3-year follow-up	1
Vilarrasa et al., 2013	Effect of bariatric surgery on bone mineral density: comparison of gastric bypass and sleeve gastrectomy.	1
Zhou et al., 2020	Impact of bariatric surgery on body composition and aerobic exercise capacity	1
Zhou et al., 2022	Lean Mass Loss and Altered Muscular Aerobic Capacity after Bariatric Surgery	1
Aryannezhad et al., 2021	One-year outcomes of bariatric surgery in older adults: a case-matched analysis based on the Tehran Obesity Treatment Study.	2
Sivakumar et al., 2022	Body Composition Differences Between Excess Weight Loss ≥ 50% and < 50% at 12 Months Following Bariatric Surgery.	2
Alba et al., 2017	Muscle mass, muscle strength, and physical function in obese individuals undergoing gastric bypass surgery	3
Baad et al., 2022	Body Composition, Sarcopenia and Physical Performance After Bariatric Surgery: Differences Between Sleeve Gastrectomy and Roux-En-Y Gastric Bypass	3
Campanha-Versiani et al., 2014	One year physical training may atenuate spine bone loss and improve muscle strengh in individuals submitted to bariatric surgery	3
Coral et al., 2021	Improvement in Muscle Strength and Metabolic Parameters Despite Muscle Mass Loss in the Initial Six Months After Bariatric Surgery	3
De Stefano et al., 2012	Effect on body composition and muscular performance of weight loss in patients with severe obesity. Comparison between old and young	3
Faria et al., 2016	Muscle strength and lean body mass evaluation among roux-en-y gastric bypass patients	3
Huber et al., 2023	Biomechanical CT to Assess Bone After Sleeve Gastrectomy in Adolescents With Obesity: A Prospective Longitudinal Study	3
Huettner et al., 2012	Body composition analysis in bariatric surgery: use of air displacement plethysmograph.	3
Kim et al., 2016	Sleeve gastrectomy and roux-en-y gastric bypass lead to comparable changes in body composition in an asian population	3
Ricco et al., 2018	Post bariatric surgery polyneuropathy: Gastric banding vs. gastric bypass	3

Ruthes et al., 2022	Lean mass and strength profile of women submitted to bariatric surgery: comparison of the EWGSOP2 and FNIH classification for sarcopenia–ASBS program phase II	3
Wadström et al., 1991	The effect of excessive weight loss on skeletal muscle in man. A study of obese patients following gastroplasty.	3
Auclair et al., 2020	Changes in fat-free mass and muscle mass at 6 and 12 months after biliopancreatic diversion with duodenal switch surgery.	4
Buzza et al., 2022	Prevalence of sarcopenia in women at stable weight phase after Roux-en-Y gastric bypass.	4
de Oliveira et al., 2020	Body Composition, Serum Sclerostin and Physical Function After Bariatric Surgery: Performance of Dual-Energy X-ray Absorptiometry and Multifrequency Bioelectrical Impedance Analysis.	4
Freitas et al., 2017	The role of exercise in a weight-loss program on clinical control in obese adults with Asthma: A randomized controlled trial	4
Gil et al., 2021	A randomized clinical trial on the effects of exercise on muscle remodelling following bariatric surgery	4
Kulovitz et al., 2014	Medical weight loss versus bariatric surgery: does method affect body composition and weight maintenance after 15% reduction in body weight?	4
Santini et al., 2022	Long-term body composition improvement in post-menopausal women following bariatric surgery: a cross-sectional and case-control study.	4
Stevens et al., 2011	The influence of overweight/obesity on patient-perceived physical functioning and health-related quality of life after primary total hip arthroplasty	4
Teichtahl et al., 2016	Associations of surgical and nonsurgical weight loss with knee musculature: a cohort study of obese adults.	4
Waldburger et al., 2016	Comprehensive assessment of physical functioning in bariatric surgery candidates compared with subjects without obesity	4

Legend – Exclusion criteria: 1–No prevalence of sarcopenia (N=52); 2–Re-operation (N=2); 3–Article not found (N=12); 4–Sample of patients without bariatric surgery (N=10).