



Correlation of afamin protein with bariatric surgery in female Iraqi patients with diabetes mellitus

Lamia H. A. Al- Sultan^{1*}, Lubna A. A. Al-Assaf²

¹Medical Technical Institute, Middle Technical University, Baghdad, Iraq.

²College of Remote Sensing and Geophysics, Al-Karkh University for Science, Baghdad, Iraq.

ARTICLE INFO

Received: 6/1/2025

Revised : 1/3/2025

Accepted: 17/3/2025

*Corresponding author:

Lamia H A Al- Sultan, Ph.D

E-mail: lamia_sultan@mtu.edu.iq

Mobile: +964776428543

P-ISSN: 2974-4334

E-ISSN: 2974-4324

DOI:

10.21608/bbj.2025.350846.1073

ABSTRACT

The bioactive protein afamin (AFA) comes from the liver. Elevated AFA levels are associated with obesity and the metabolic syndrome. The most successful treatment for obesity is bariatric surgery (BS), leading to significant weight loss and metabolic benefits. Therefore, the purpose of this research was to evaluate the effectiveness of BS in managing type 2 diabetes and to summarize some of the most common vitamin and mineral deficiencies associated with BS, particularly the impact on AFA protein. In three periods, forty patients aged 40–50 years were compared with obese individuals prior to surgery and after six and twelve months of BS. ELISA was utilized to measure the quantities of AFA. Using an automated spectrophotometer, the Cobas E411 device measures calcium, lipid profiles, vitamins, and hormones. The results of the study showed that, at 6 month and 12 month following BS, patients' BMI, HbA1C, HOMA IR, lipid profile, and insulin values all decreased statistically significantly ($p < 0.05$); however, there was a statistically significant decreased in blood AFA levels. Following a 6-month BS group, the patient's calcium, vitamin B12 and vitamin D3 concentrations were all noticeably higher than those of the patients following a 12-month BS group was decreased. Recent research suggests that there may be a cause-and-effect relationship between AFA and obesity. Serum AFA levels decreased as a result of weight loss following BS. The potential of receiver operating characteristic of AFA as a metabolic syndrome indicator may lead to future advancements in the medical treatment of obesity.

Keywords: Afamin, Bariatric surgery, Lipid profile, Obesity, Diabetes mellitus

1. Introduction

Severe obesity is defined as having a body mass index (BMI) of 35 kg/m² or greater (Potter et al., 2024). A healthy and balanced body can now be attained through obesity surgery, which has risen in popularity in recent years. But a lot of diseases are closely linked with surgical procedures such as diabetes, joint diseases, scoliosis, as well as cases of hormonal imbalance, polycystic ovary syndrome, and others (Pakhare and Anjankar, 2024; Sitharthan, 2024; Jacquinet, 2025). For

patients who are extremely obese and have exhausted nonsurgical weight loss options, bariatric surgery (BS), is an increasingly practical option. Beyond helping patients lose weight right away, BS improves a variety of health markers after surgery (Lourdes, 2025; Saavedra et al., 2025). The objective of BS is to reduce the size of the patient's stomach in order to limit their calorie intake. As a result, eating is reduced, and weight reduction happens gradually over time. For instance, an 80% reduction in

stomach size following a sleeve gastrectomy (SG) leads to a notable decrease in the amount of solid food taken and calories lost.

As one of the most popular surgical procedures for weight loss, SG spares the upper portion of the intestine and is utilized widely in the USA, Europe, and many Asian countries (Honda et al., 2024). Still, there are some side effects from these surgical procedures, and deficiencies in specific vitamins and micronutrients are common in post-bariatric patients (Reytor-González et al., 2025; Eberstadt et al., 2025). It is believed that different BS methods have different effects on the absorption of micronutrients. SG have an effect on the absorption of B12, iron, zinc, selenium, and folate because of their pure restrictive nature, in addition to several studies that have looked into the results of physical functioning and fitness capacity (Nayakpara and Vishwakarma, 2024). These latter results are recognized to be significant in the context of obesity, particularly given that they are thought to be significant mediators in the development of cardiovascular disease risk factors in this population (Béraud-Peigne et al., 2024; Jones et al., 2024). The purpose of this systematic review was to provide an overview of current research on the effects of BS alone, foremost of which is knowing the health and clinical pros and cons associated with such surgeries, as well as identifying the information that those who have performed the surgery have regarding these surgeries and the repercussions that may accompany them after a period of time. Because surgery requires careful health follow-up, which is accompanied by a severe deficiency of nutrients, vitamins and minerals due to the patient's inability to eat solid foods and his dependence on liquid foods in very small quantities that are almost not sufficient for the body's need for nutrient (Wali et al., 2024; de Medeiros Filho et al., 2025). Thus, relying only on the body's stock of substances and vitamins, which are certainly not sufficient to fill the deficiency, so the patient resorts to nutritional supplements (Thakur et al., 2024).

Afamin (AFM) is a glycoprotein that was identified as the fourth gene belonging to the human albumin family, which also contains alpha-fetoprotein, albumin, and vitamin D binding protein (Kollerits et al., 2024). AFM is

a protein that binds to vitamin E and is mostly synthesized in the liver. It is released into the bloodstream and is a new metabolic marker for cancer, metabolic syndrome, and diabetes mellitus (DM) (Abed et al., 2023). AFM is associated with a number diseases, including papillary obesity with D.M (Yang et al., 2025).

2. Material and methods

Sample collection and study design

All Iraqi patients doing BS, who were 40-50 years of age (n = 40) were participated. In three period, before surgery obese patients were compared with the same patients after 6 and 12 month BS. Individuals who underwent surgery had diabetes. All laboratory examinations were performed in the private laboratory.

The current study includes identifying BMI was measured by measuring the body height and weight of sick and healthy people using a height scale in units of centimeters (cm) and weight using a sensitive person scale in units of kilograms (kg). BMI was calculated according to the following formula: weight (kg) / height (m²) (McArdle et al., 2006).

Blood samples were obtained to assess the HbA1c, HOMA IR, hormones, vitamins (using Liener kit), and lipid profile using a colorimetric method according to the procedure kit provided by the biosystem. Utilizing the oxidase method, triglycerides (TG), total cholesterol (TC), and high-density lipoprotein cholesterol (HDL-C) were determined. Next, using the lipid measurement and the Friedewald computation, low-density lipoprotein cholesterol (LDL-C) was calculated (Kalra et al., 2019). Serum AFM test kit by ELISA method supplied

Statistical analysis

Prism 9.5.0 was used to execute all analyses and create the necessary graphics for the data analysis. The information was presented as means \pm SD independent one-way Anova to compare parameter means between groups; we performed the more general descriptive statistic to give a high-level summary of our results. Significant statistics were defined to mean with a p -value < 0.001. Pearson's correlation coefficients (r) and their significant were used for analyzing results between all biochemical parameters. The cut-off value of anthropometric markers for AFA was set using receiver

operating characteristic (ROC) curve analysis to assess the relative contribution of obesity to AFA in the obese participants compared to the study subjects overall.

4. Results

The statistical analysis of 30 samples comparison was done between the studied groups (before surgery, after 6- and 12 months surgery). The comparison in Tables (1), show a significant difference ($p < 0.05$) for all properties of the studied BMI, Hb1Ac and AFM, a highly significant increase in this parameter ($p < 0.001$) when a comparison between groups. Group 1 (G1) patients before BS, G2 patients after 6-months BS, G3 patients after 12-months BS. The measured weight in the patients with D.M were 137.4 ± 2.50 Kg and BMI 54.33 ± 1.45 Kg/Cm³, respectively in patients before BS. While after 6 and 12 month BS they were 102 ± 2.00 , 66 ± 2.00 Kg, 40.23 ± 1.02 and 25.73 ± 0.64 Kg/Cm³, respectively and the difference between groups were statistically significant ($p < 0.001$).

Table 1. The comparison of BMI and weight in three groups

Parameters	Groups	Weight (Kg)	BMI (Kg/Cm ³)
Mean \pm SD	G1	137.4 ± 2.50	54.33 ± 1.45
	G2	102 ± 2.00	40.23 ± 1.02
	G3	66 ± 2.00	25.73 ± 0.64
p -value	G1 vs. G2, $p < 0.001$ ***		
	G1 vs. G3, $p < 0.001$ ***		
	G2 vs. G3, $p < 0.001$ ***		

*** refer to highly significant.

As it was clear in the first patients' group with age of (40-50) year, the level of HOMA concentration (after 6-month and 12-month BS) was statistically significantly decreased ($p < 0.001$) as compared with the patients before BS. This shown in the table2.

Table 2. The comparison of HOMA IR and Hb1Ac in three groups

Parameters	Groups	HOMA IR	HbA1c
Mean \pm SD	G1	3.23 ± 0.35	6.74 ± 0.78
	G2	2.23 ± 0.12	5.85 ± 0.59
	G3	1.3 ± 0.34	4.60 ± 0.45
p -value	G1 vs. G2, $p < 0.001$ **		
	G1 vs G3, $p < 0.001$ ***		
	G2 vs G3, $p < 0.001$ **		

*** refer to highly significant.

The changes in the measured lipid profile in three groups of the patient individuals were presented

in **Error! Reference source not found..** In the patients before BS, the level of TC, TG, LDL and VLDL increased compared with the patients after 6-month BS and 12-month BS groups and the difference between them was statistically significant ($p = 0.06$), ($p = 0.08$), ($p = 0.11$) and ($p = 0.12$) respectively when compared lipid profile before BS with patients after 6-month BS and 12-month BS groups. Will ($p < 0.001$) when compared between as. In HDL levels decreased in the patients before BS, and the difference was statistically significant ($p = 0.46$).

Table 3. The comparison of lipid profile in three groups

Parameters		Mean \pm SD	p -value
TC	G1	281 ± 14.97	G1 vs. G2, $p = 0.06$
	G2	260.6 ± 12.50	G1 vs. G3, $p < 0.001$ ***
	G3	162 ± 10.95	G2 vs. G3, $p < 0.001$ **
TG	G1	251.6 ± 40.57	G1 vs. G2, $p = 0.08$
	G2	211.4 ± 30.11	G1 vs. G3, $p < 0.001$ ***
	G3	95.61 ± 9.36	G2 vs. G3, $p < 0.001$ ***
HDL	G1	33.23 ± 0.82	G1 vs. G2, $p = 0.46$
	G2	35.80 ± 2.16	G1 vs. G3, $p < 0.001$ ***
	G3	49.6 ± 3.20	G2 vs. G3, $p < 0.001$ ***
LDL	G1	218.3 ± 17.29	G1 vs. G2, $p = 0.11$
	G2	194.8 ± 21.53	G1 vs. G3, $p < 0.001$ ***
	G3	93.88 ± 10.67	G2 vs. G3, $p < 0.001$ ***
VLDL	G1	50.36 ± 8.10	G1 vs. G2, $p = 0.12$
	G2	42.26 ± 6.30	G1 vs. G3, $p < 0.001$ ***
	G3	19.12 ± 1.86	G2 vs. G3, $p < 0.001$ ***

*** refer to highly significant

To look out the variation in the concentration of ca, Vit B12 and Vit D3 was affected in the table 4. The groups (before BS, after 6-month and patients after 12 month) were divided based on time period. This parameter increased in G2 (after 6 month BS) then the values decreased again in the G3 and the statistically significantly ($p < 0.001$).

Table 4. The comparison of micronutrient in three groups

Parameters		Mean \pm SD	p-value
Ca	G1	7.23 \pm 0.57	G1 vs. G2, $p = 0.006^{**}$
	G2	9.13 \pm 0.15	G1 vs. G3, $p = 0.137$
	G3	6.82 \pm 0.50	G2 vs. G3, $p < 0.001^{***}$
Vit B12	G1	273.3 \pm 25.15	G1 vs. G2, $p < 0.001^{***}$
	G2	716.2 \pm 1.57	G1 vs. G3, $p < 0.001^{***}$
	G3	509 \pm 7.93	G2 vs. G3, $p < 0.001^{***}$
Vit D3	G1	4.10 \pm 0.17	G1 vs. G2, $p < 0.001^{***}$
	G2	34.17 \pm 1.04	G1 vs. G3, $p < 0.001^{**}$
	G3	7.26 \pm 0.30	G2 vs. G3, $p < 0.001^{***}$

*** refer to highly significant

That was a slightly increase AFM in the patients before BS (87.69 \pm 2.13) but it is decreased in the patients after 6 and 12-month BS (62.86 \pm 2.30), (41.91 \pm 1.08) respectively and the difference between groups were statistically significant ($p < 0.001$).

The results as well showed in the Table 5.

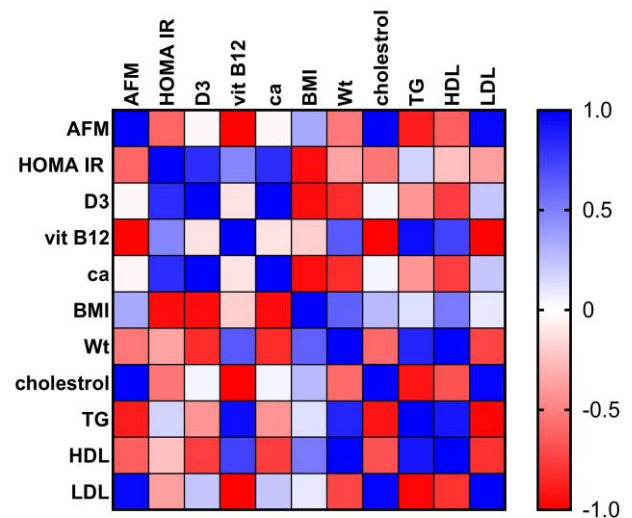
Table 5. The concentration of AFM in three groups

Parameters	Groups	Mean \pm SD
Afamin (ug/ ml)	G 1	87.69 \pm 2.13
	G 2	62.86 \pm 2.30
	G 3	41.91 \pm 1.08
p-value	G1vs.G2, $p < 0.001^{**}$	
	G1vs G3, $p < 0.001^{***}$	
	G2 vs. G3, $p < 0.001^{**}$	

*** refer to highly significant.

correlation

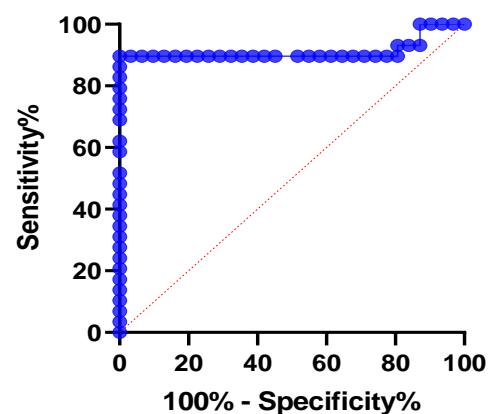
As per the r-person statistical approach, there appears to be evidence of a connection between the parameters based on the statistical data. When r approaches 1, there is a linear correlation between the two parameters; when r approaches -1, there is an inverse correlation. There is no link between the parameters when r gets closer to zero.

Table 5. Correlation between all parameters before BS surgery

Area under and the curve ROC for AFM

The ROC curves were analyzed for AFM in circulation to investigate its predictive value.

The optimal cutoff value for circulating AFA to predict obesity before BS in patients with patients after 6 and 12 month BS was found to be < 68.67 ng/ml, < 47.10 (sensitivity: 100%, specificity: 83.89%, 100%, and AUC: 1.00) at a 95% confidence interval of (0.995 ~ 0.999) and $p < 0.001$ shows in figures 1A and B). So can be use AFA as indicator to predict obesity with D.M.

**Fig.1A.** ROC curve of AFM (before BS- after 6 month BS)

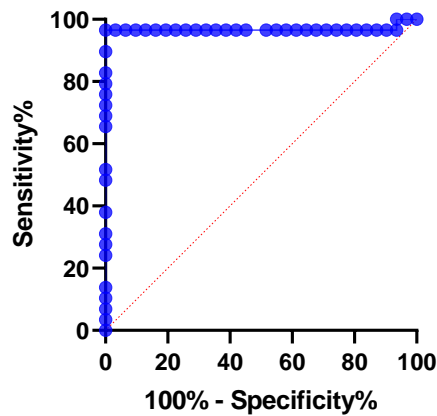


Fig.1B. ROC curve of AFA (before BS- after 12 month BS)

5. Discussion

The stomach's capacity is reduced by reducing its size through BS (McCarty and Turro, 2025). Consequently, the anatomical exclusion of the foregut after BS is the cause of loss of weight (Brunaldi et al., 2024, Vélez et al., 2024) In the Table 2, patient D.M.'s improved insulin sensitivity following BS can be explained as lifestyle modifications, but this is not the only explanation. This is because the patient has lost weight (Rohmann et al., 2025, Harby et al., 2025). The mean of lipid profile in the different groups was determined and the results are described in the Table 3 that showed a statistical comparison of TC, TG, HDL, LDL and VLDL between groups indicates highly significant increase ($p < 0.001$). This study provided a thorough investigation of the positive correlations between obesity and TC, TG, and LDL levels as well as the negative correlations between obesity and HDL levels (Huang et al., 2025; Chen et al., 2025). This fundamental became reversed after BS (Plath et al., 2025).

The increase occurring 6 months after BS is a result of taking nutritional supplements, but these supplements do not satisfy the body's needs and as a result of poor absorption, it was noticed a decrease in nutrients after 12 months. Before undergoing BS, severely obese patients have a variety of nutritional deficits (Simancas-Racines et al., 2025, Frias-Toral et al., 2025). The poor food choices that supply insufficient amounts of vitamins and minerals despite a bigger total calorie consumption have been

suggested to be the cause of the less prosperous nutritional status after BS surgery. Intestinal dysbiosis is a result of poor eating habits marked by a lack of dietary diversity and an inadequate intake of essential nutrients (Salahi et al., 2025).

Chronic diseases are linked to additional variables influencing the dietary status of patients seeking BS (Liu et al., 2025, Kawam et al., 2025, medication (Soliman et al., 2025, Ganga et al., 2025), Rapid losing weight that typically occurs before to surgery (O'Neill et al., 2024) or severe dieting (Concepción-Zavaleta et al., 2024). According to several research examining the micronutrient inadequacies of BS candidates, there is at least one baseline vitamin or mineral shortage present in these patients (Ast et al., 2025). In the current study, the most prevalent dietary deficits and the prevalence of patients who had evaluations before BS. For bariatric patients, vitamin D deficiency—measured as plasma 25(OH)D—is especially concerning because it is the most common dietary shortfall found prior to BS (Grant et al., 2025). Sequestration of vitamin D in adipose tissue, as previously described, may potentially account for vitamin D absence in patients undergoing surgery for obesity, in addition to poor diet and rapid preoperative weight loss (Lee, 2025). However, some authors argue that the low levels of vitamin D in obesity are caused by dilution rather than absorbing in the expanded adipose tissue (Davies, 2024; Wimalawansa, 2025).

Significant clinical effects, such as compromised musculoskeletal health, secondary hyperparathyroidism, increased risk of infections, or reduced weight loss after BS surgery, are associated with low levels of vitamin D in BS candidates (Schiavo et al., 2024). Providing calcium supplements exclusively to people who don't get enough of the mineral seems adequate (Soni et al., 2024). When vitamin B12 is absorbed while bound to proteins in food, it breaks free of these complexes and attaches itself to intrinsic factor released by parietal cells in the distal ileum. One important factor in the release of cobalamin from protein complexes is gastric acid (Brunaldi et al., 2025). Changes in gastrointestinal pathways carried on by BS, medicines, and gastrointestinal disorders all have

an impact on the complex absorption process of cobalamin. But more than any other vitamin in the vitamin B12 is stored in the liver. Therefore, it typically takes years of inadequate nutrition for cobalamin insufficiency to develop (Anwar et al., 2024).

Clinical manifestations of B12 deficiency can include peripheral neuropathy, megaloblastic anemia, or neuropsychiatric symptoms (Ralapanawa et al., 2015). Circulating AFA concentration was significantly higher in the obese group before BS (87.69 ± 2.13) compared to the same patients after 6 and 12 month to BS (62.86 ± 2.30 , 41.91 ± 1.08) this results agreed to (Moulder et al., 2023). AFM was strongly associated with the prevalence and development of metabolic syndrome (Ratku et al., 2024). another study found a correlation between T2-DM and AFA values, and it was thought that AFA could be a new marker for the follow-up of individuals at risk of T2-DM (Pramodkumar et al., 2025) In another study, the relationship between serum AFA and dyslipidemia (Abdullah et al., 2024). In this study, we observed that the components forming the metabolic syndrome regressed with BS and there was a significant decrease in HbA1c values of T2-DM patients. Table 5 shows correlation parameters with each other before BS surgery, insulin resistance shown strong negatively correlation with HbA1c and BMI. Also, negatively correlation with body fat mass, but strong positivity correlation with Vit D3, Ca and folate, weakly correlation with Vit B12 and water amount. This result agreed with the study of Kalmpourtzidou et al. (2024) and Rudzka et al. (2024). HbA1c showed strong negatively correlation with Vit D3, Ca, and folate (Kiran et al., 2024), but strong positively correlation with BMI (Nguyen et al., 2025). Vit D3 showed strong positivity correlation with all parameter in the Table 5 except with Vit B12 and body fat mass there is no correlation.

Vit B12 has strong positive correlation with TG, HDL, VLDL and strong negatively correlation with TC and LDL (Cilar Budler et al., 2025). Also, Ferritin and body fat mass shows negatively correlation with TG, HDL and VLDL (Bayram and Türker, 2024). TC was negatively correlated with TG, HDL and VLDL. While, it

was positively correlated with LDL, TG (Bian et al., 2024)

Conclusion

BS when combined with additional therapies to address weight control and comorbidities related to obesity, is the best course of treatment for morbid and complex obesity. Beyond simple lifestyle modifications and medication, BS improves metabolism and can lead to substantial, long-lasting weight loss.

Ethical issues

This study has been compiled based on the national center for educational laboratories at the Medical City Hospital, Baghdad – Iraq (ID: CSEC/0423/0035). Besides, ethical issues (including plagiarism, data fabrication, and double publication) have been completely observed by the authors.

Funding/Support

No financial support was received.

Conflicts of interest

There are no competing interests.

5. Reference

- Abdullah B, Mosa A, Salih S, Jasim J, Yousif R, Mahmood S, Yousif D, 2024. Serum Afamin in Prediabetic Individuals in Association with Insulin Resistance and Glycemic Indices: A Case-Control Study. *European Journal of Medical and Health Research*, 2(4): p. 86-91.
- Abed BA, Farhan LO, Salman IN, 2023. A Review of Afamin as Metabolic Novel Marker of Many Diseases. *Wasit Journal for Pure Sciences*, 2(4).
- Anwar S, Kumar V, and Raut R, 2024. A review on factors causing vitamin b12 deficiency in pregnant women and infants. *IJCRT*, 12: p. 1-13.
- Ast HK, Hammer M, Zhang S, Bruton A, Hatsu IE, Leung B, McClure R, Srikanth P, Farris Y, 2025. Gut microbiome changes with micronutrient supplementation in children with attention-deficit/hyperactivity disorder: the MADDY study, 17(1): p. 2463570.
- Bayram B, Türker P, 2024. Dietary iron intake aggravates dyslipidaemia by elevating ferritin levels in patients with insulin resistance and cardiovascular diseases: A

- cross-sectional study. *Acta Alimentaria*, 53(1): p. 1-11.
- Béraud-Peigné N, Maillot P, Perrot A, 2024. The effects of a new immersive multidomain training on cognitive, dual-task and physical functions in older adults. *GeroScience*, 46(2): p. 1825-1841.
- Bian L, Tang T, Yu Q, Tong X, Hu S, Y You, S Zhang, 2024. Association between the triglyceride to high-density lipoprotein cholesterol ratio and type 2 diabetes mellitus in non-alcoholic fatty liver disease. *Scientific Reports*, 14(1): p. 31048.
- Brunaldi VO, Abboud DM, Abusaleh RR, Annan K Al, Razzak FA, Ravi K, Valls EJ, 2024. Post-bariatric surgery changes in secondary esophageal motility and distensibility parameters. *Obesity Surgery*, 34(2): p. 347-354.
- Carty TR Mc, Turro R, 2025. POSE™ Procedure: A Safe and Effective Endoluminal Bariatric Procedure, in *Bariatric Endoscopy*. Springer. p. 389-394.
- Chen Z, Zhou R, Liu X, Wang J, L Wang, Lv Y, Yu L, 2025. Effects of Aerobic Exercise on Blood Lipids in People with Overweight or Obesity: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Life*, 15(2): p. 166.
- Cilar Budler L, Spevan M, Ivanisevic K, Budler M, 2025. Evidence-Based Recommendations for Dietary Supplementation During Pregnancy: Is It Time for a Product Recall? *Reproductive, Female and Child Health*, 4(1): p. e70011.
- Concepción-Zavaleta M.J., Quiroz-Aldave JE, Durand-Vásquez MC, Gamarra-Osorio ER, 2024. A comprehensive review of genetic causes of obesity. *World Journal of Pediatrics*, 20(1): p. 26-39.
- De Medeiros Filho FS, de Oliveira Marinho LJ, de CC, Freitas Moreira, Lopes AA, 2025. Challenges and Management of Nutritional Deficiencies and Metabolic Complications Post-Bariatric Surgery: A Preventive and Multidisciplinary Approach. *Brazilian Journal of Health Review*, 8(1): p. e76442-e76442.
- Frias-Toral E, Chapela S, Gonzalez V, Martinuzzi V, Locatelli J, Llobera N, Manrique E, 2025. Optimizing Nutritional Management Before and After Bariatric Surgery: A Comprehensive Guide for Sustained Weight Loss and Metabolic Health. *Nutrients*, 17(4): p. 688.
- Ganga R, Zorrilla-Nunez LF, Menzo ELO, 2025. Diagnosis and Treatment of Dumping Syndrome After Gastric Bypass for Morbid Obesity, in *Bariatric Endoscopy*, Springer. p. 229-239.
- Grant WB, Wimalawansa SJ, Pludowski P, Cheng RZ, 2025. Vitamin D: Evidence-based health benefits and recommendations for WD McArdle, FI Katch, VL Katch, 2006. *Essentials of exercise physiology*. Lippincott Williams & Wilkins.
- Harby SA, Fathelbab, Nawwar BM, Sheta E, Halwag D, Elneily DAE, Habiba ES, 2025. Liraglutide and denatonium benzoate attenuate T2DM-induced metabolic, neurological, and testicular changes in rats: Targeting oxidative stress, inflammation, and BCRP transporter. *Journal of Molecular Histology*, 56(2): p. 1-17.
- Honda D, Li PH, AK Jindal, Katelari CH s, Zhi YX, 2024. Uncovering the true burden of hereditary angioedema due to C1-inhibitor deficiency: A focus on the Asia-Pacific region. *Journal of Allergy and Clinical Immunology*, 153(1): p. 42-54.
- Huang L, Liu Z, Zhang H, Li D, Li Z, Huang J, He J, Lu L, Wen H, Yuan H, Gu H, Ye Y, Lu J, 2025. The Association between Serum Lipid Profile Levels and Hypertension Grades: A Cross-Sectional Study at a Health Examination Center. *High Blood Pressure & Cardiovascular Prevention*, 32(1): p. 87-98.
- Jones MD, Clifford BK, Stamatakis E, Gibbs MT, 2024. Exercise snacks and other forms of intermittent physical activity for improving health in adults and older adults: a scoping review of epidemiological, experimental and qualitative studies. *Sports Medicine*, 54(4): p. 813-835.
- Kalra S, Aggarwal S, Khandelwal D, 2019. Thyroid dysfunction and type 2 diabetes mellitus: screening strategies and implications for management. *Diabetes Therapy*, 10(6): p. 2035-2044.
- Kawam O, Zhu X, Watson S, Martin-Lillie C, Arthurs J, Eton DT, Rutten LJF, Shapiro S, 2025. Factors that Influence Unproven

- Stem Cell Intervention Seeking Behavior: a qualitative analysis of US patients considering or having undertaken unproven stem cell interventions. *Social Science & Medicine*, p. 117795.
- Kiran BR, VS Kumar, GP Preeti, VA Kumar, BR Vikas, 2024. Vitamin D and HbA1c levels in newly diagnosed type 2 diabetes mellitus. *MGM Journal of Medical Sciences*, 11(4): p. 722-727.
- Kollerits B, Kotsis F, Schneider MP, Schultheiss UT, Weissensteiner H, Lee M.-J., 2025. Vitamin D Enhancement of Adipose Biology: Implications on Obesity-Associated Cardiometabolic Diseases. *Nutrients*, 17(3): p. 586.
- Liu S, Xiong X, Zhang M, Xiang Q, Guo T, Song Y, 2025. Influencing factors of frailty in older patients with chronic heart failure: Based on Bayesian network. *Asian Nursing Research* .55(2): p. 32-63.
- Lourdes, Marta Francisca Magalhães de , 2025. Getting back on track: alternative healthcare delivery strategies to prevent weight regain after bariatric surgery.
- Nayakpara P, Vishwakarma N, 2024. A Review on the Management of Nutritional and Metabolic Problems Following Bariatric Surgery.
- Nguyen NTH, Bai CH, Chang JS, Chen YC, Huang YL, Wang FF, Hsu CY, Das A, Chao JCJ, 2025. Association of nutrient intake and dietary patterns with serum folate and anemia-related biomarkers in Taiwanese pregnant women with pre-pregnancy overweightness or obesity. *International Journal of Medical Sciences*, 22(7): p. 1630-1639.
- O'Neill E.S, AL Wiegmann, Parrella N, Pittman T, Hood K, Kurlander D, 2024. Injectable weight loss medications in plastic surgery: what we know, perioperative considerations, and recommendations for the future. *Plastic and Reconstructive Surgery–Global Open*, 12(1): p. e5516.
- Pakhare M Anjankar A, 2024. Critical correlation between obesity and cardiovascular diseases and recent advancements in obesity. *Cureus*, 16(1).
- Plath L, Vannijvel M, Okkema S, Deleus E, Lloyd A, Lo Menzo E, Tadros G, Raguz I, 2025. Reversal of Roux-en-Y Gastric Bypass: A Multi-Centric Analysis of Indications, Techniques, and Surgical Outcomes. *Obesity Surgery*, p. 1-10.
- Potter Aw, Chin GC, Looney DP, Friedl KE, 2024. Defining overweight and obesity by percent body fat instead of body mass index. *The Journal of Clinical Endocrinology & Metabolism*, p. dgae341.
- Pramodkumar TH, HannahW, Anjana RM, Ram U, Tiwaskar M, Gokulakrishnan K, 2025. Biomarkers of Gestational Diabetes Mellitus: Mechanisms, Advances, and Clinical Utility. *Journal of The Association of Physicians of India*, 73(2): p. 57.
- Ralapanawa , Jayawickreme KP, 2015. B 12 deficiency with neurological manifestations in the absence of anaemia .*BMC research notes*, 8: p. 1-4.
- Ratku B, Lőrincz H, Csiha S, Sebestyen V, Berta E, Bodor M, Nagy EV, Szabo Z, Harangi M, 2024. Serum afamin and its implications in adult growth hormone deficiency: A prospective GH-withdrawal study. *Frontiers in Endocrinology*, 15: p. 1348046.
- Reytor-González C, Frias-Toral E, Nuñez-Vásquez C, Parise-Vasco JM, 2025. Preventing and Managing Pre-and Postoperative Micronutrient Deficiencies: A Vital Component of Long-Term Success in Bariatric Surgery. *Nutrients*, 17(5): p. 741.
- Rohmann N, Epe J, Geisler C, Schlicht K, Türk K, Hartmann K, Kruse L, Koppenhagen J, 2025. Comprehensive evaluation of diabetes subtypes in a European cohort reveals stronger differences of lifestyle, education and psychosocial parameters compared to metabolic or inflammatory factors. *Cardiovascular Diabetology*, 24(1): p. 1-14.
- Saavedra R, Ramirez B, Jay B, 2025. Strategies to Manage Obesity: Lifestyle. *Methodist DeBaakey Cardiovascular Journal*, 21(2): p. 53.
- Salahi A, Abd El-Ghany WA, Attia YA, Zabermawi NM, Bovera F, Tufarelli V, 2025. Gut dysbiosis: Nutritional causes and risk prevention in poultry, with reference to other animals. *South African Journal of Animal Science*, 55(2): p. 32-63.

- Schiavo L, Santella B, Paolini B, Rahimi F, Giglio E, Martinelli B, Boschetti S, Bertolani L, 2024. Adding Branched-Chain Amino Acids and Vitamin D to Whey Protein Is More Effective than Protein Alone in Preserving Fat Free Mass and Muscle Strength in the First Month after Sleeve Gastrectomy. *Nutrients*, 16(10): p. 1448.
- Schönherr S, Forer L, 2024. Association of serum afamin concentrations with kidney failure in patients with CKD: Findings from the German CKD cohort study. *American Journal of Kidney Diseases*.
- Simancas-Racines D, Frias-Toral E, Campuzano-Donoso M, Ramos-Sarmiento D, 2025. Preoperative Nutrition in Bariatric Surgery: A Narrative Review on Enhancing Surgical Success and Patient Outcomes. *Nutrients*, 17(3): p. 566
- Sitharthan R, 2024. Action Of Homoeopathy in Chronic Diseases—A Retrospective Analysis. *Advancements in Homeopathic Research*.
- Soni G, Kochar GK, Pant P, Singh G, 2022. A Review Study on Benefits of Calcium Supplementation on Adolescent Bone Mineral Density. *International journal of health sciences*. 6(S8): p. 1342-1353.
- Thakur A, Kumar R, Shah K, Chauhan NS, Baldi A, 2024. Nutraceuticals and Suboptimal Health: The Relationship and Significance, in *Nutraceuticals: A New Millennium Approach for Preventive Medicine*. Springer. p. 305-343.
- Vélez C, Neuringer I, Schwarzenberg SJ, 2024. The foregut in cystic fibrosis. *Pediatric Pulmonology*, 59: p. S61-S69.
- Wali MH, Bekova K, Abdulla N, 2024. Adherence to nutritional supplementation, follow-up care, and lost to follow-up in post bariatric surgery patients. *Journal of Ayub Medical College Abbottabad*, 36(2): p. 417-426.
- Yang RS, Chan DC, Chung YP, Liu SH. Chronic Kidney Disease and Osteoarthritis: Current Understanding and Future Research Directions. *International Journal of Molecular Sciences*, 26(4): p. 1567.