XXVIII IFSO World Congress
9-12 September 2025 | Santiago, Chile

Effect of meal timing in weight loss and food consumption outcomes during first year after bariatric surgery

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IFSO 2025 Santiago
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Financial relationchip Disclosure

X	No, nothing to disclose
	Yes, please specify:

We didn't have any financial sponsorship for this research.

Introduction

- Chrononutrition is a subfield of chronobiology that investigates the influence of meal timing on metabolism and health.
- Evidence shows that the temporal distribution of food intake (especially late breakfast and dinner) can impact weight loss, appetite regulation, energy expenditure, sleep quality, and metabolic outcomes.
- When food intake is aligned with circadian rhythms, we see improvements in energy balance and metabolic health. This reinforces the importance of considering not only "what " we eat, but also "when" we eat.

Poor dietary patterns
(Carvalho et al., 2025)

Worse sleep quality
(Carvalho et al., 2025)

Obesity
(Vujović et al., 2022)

Cardiovascular diseases
(St-Onge et al., 2025)

The scientific literature studies with these associations in patients undergoing bariatric surgery is still scarce.

Type II diabetes mellitus
(Garaulet et al., 2022)

Worse metabolic parameters
(Gu et al., 2020)

Increased blood pressure
(Shang et al., 2021)

Objective

- To evaluate the impact of meal timing on weight loss and food consumption during the first year after bariatric surgery.

Methods

Baseline → **3 Months** → **6 Months** → **1 Year**

- Longitudinal study;
- Total of 122 bariatric patients;
- Roux-en-Y gastric bypass and sleeve;
- Inclusion criteria were: Patients in the baseline period of bariatric surgery, aged between 18 and 59 years old, a body mass index (BMI) ≥ 35 kg/m² associated with two comorbidities or BMI > 40 kg/m² regardless of comorbidities;
- Exclusion criteria was: Revisional surgery.

Methods

Food Consumption → Two Recall 24HRS in each 4 moments, which one of them during weekdays and the other on the weekends (Totaling 976 RECALLS) - according to multiple-pass method (Moshfegah et al., 2008)

Weight loss → We measured the reduction of weight in Kilograms / Percentage / BMI

Meal time → First and last meal time
We considered an eating event was defined as ≥ 50 kcal.

Statistical analysis

- **Linear regression** – To evaluate the associations between first and last meal timing with weight loss and food consumption during 1 year follow-up.

- **Adjustments -** Gender, age, surgical technique, family income, use of sleep medications, physical activity, and shift work.

Results

Table1. Sociodemographic characteristicals and surgical techniques of participants.

Variables	All (n= 122)
Gender	
Female (%)	**94 (77.0)**
Male (%)	28 (23.0)
Age (Years)	**33.0 [28.0 – 41.7]**
Surgical Technique	
Roux-en-Y gastric bypass (%)	**97 (79.5)**
Sleeve gastrectomy (%)	25 (20.5)
Family Income	
3 - 6 minimum wage (%)	20 (16.3)
6 - 9 minimum wage (%)	38 (31.1)
Above 10 minimum wage (%)	31 (25.4)
Education	
Elementary school (%)	5 (8.3)
High school (%)	26 (43.3)
University degree (%)	21 (35.0)
Post-graduation (%)	8 (13.3)
Marital status	
Married (%)	81 (66.4)
Single (%)	40 (32.8)

Note: Values are presented as mean and standard error for normally distributed data or as median [interquartile range] for non-normally distributed data. Bold value is statistically significant $p < 0.05$.

Table 2. Associations between the weight loss and the mean of first and last meal timing with 3 months, 6 months and 1 year follow-up.

		First meal			Last meal		
		Coefficient (β)	P value	R^2 adjusted	Coefficient (β)	P value	R^2 adjusted
3 months	Total weight loss (Kg)	0.10	0.12	0.53	- 0.05	0.38	0.52
	Total weight loss (%)	0.15	0.05	0.22	0.02	0.76	0.18
	BMI (Kg/m²)	0.08	0.29	0.33	- 0.01	0.89	0.34
6 months	Total weight loss (Kg)	0.04	0.52	0.49	- 0.09	0.18	0.49
	Total weight loss (%)	0.03	0.71	0.11	- 0.13	0.14	0.13
	BMI (Kg/m²)	0.01	0.86	0.30	- 0.13	0.08	0.33
1 year	Total weight loss (Kg)	- 0.22	**0.04**	0.39	- 0.17	0.11	0.37
	Total weight loss (%)	- 0.22	0.08	0.15	- 0.20	0.11	0.11
	BMI (Kg/m²)	- 0.29	**0.01**	0.34	- 0.15	0.18	0.30

Note: Mean of first and last meal timing were evaluated during three moments of evaluation each variable (3 and 6 months and one year). Linear regression adjusted for sex, age, family income, type II diabetes, surgical technique, shift work, physical activity and energy intake and $p < 0.05$ was considered significant. Participants in each evaluation moments: 3 months (n = 117), 6 months (n = 113) and 1 year (n = 60).

Table 3. Association between food consumption and mean of first and last meal timing after 3 months, 6 months and 1 year follow-up.

		First meal			Last meal		
		Coefficient (β)	P value	R^2 adjusted	Coefficient (β)	P value	R^2 adjusted
Baseline	Calories (Kcal/day)	- 0.04	0.63	0.20	0.06	0.46	0.21
	Proteins (g/day)	- 0.02	0.74	0.18	0.04	0.57	0.21
	Carbohydrate (g/day)	- 0.10	0.26	0.15	0.18	**0.03**	0.17
	Total fat (g/day)	- 0.01	0.85	0.09	- 0.01	0.84	0.09
	Fibre (g/day)	- 0.09	0.33	0.003	0.07	0.42	- 0.03
3 months	Calories (Kcal/day)	- 0.03	0.75	0.05	0.12	0.16	0.10
	Proteins (g/day)	- 0.02	0.78	0.07	0.05	0.51	0.10
	Carbohydrate (g/day)	- 0.08	0.40	0.03	0.16	0.07	0.05
	Total fat (g/day)	0.05	0.61	0.07	0.06	0.49	0.08
	Fibre (g/day)	- 0.11	0.22	0.06	0.08	0.37	0.05
6 months	Calories (kcal/day)	- 0.04	0.60	0.07	0.06	0.49	0.09
	Proteins (g/day)	- 0.19	0.04	0.06	0.004	0.96	0.01
	Carbohydrate (g/day)	0.07	0.48	- 0.01	0.12	0.21	0.002
	Total fat (g/day)	0.06	0.50	0.12	0.09	0.32	0.13
	Fibre (g/day)	- 0.07	0.48	0.02	0.005	0.96	- 0.01
1 year	Calories (Kcal/day)	- 0.16	0.22	0.04	0.06	0.63	- 0.02
	Proteins (g/day)	- 0.28	**0.03**	0.09	- 0.07	0.61	0.01
	Carbohydrate (g/day)	- 0.02	0.86	0.03	0.32	**0.01**	0.19
	Total fat (g/day)	- 0.23	**0.08**	0.05	- 0.04	0.76	0.02
	Fibre (g/day)	- 0.35	**0.01**	0.10	0.008	0.95	0.02

Note: Mean of first and last meal timing were evaluated during three moments of evaluation each variable (3 and 6 months and one year).Linear regression was adjusted for sex, age, family income, type II diabetes, surgical technique, shift work, physical activity and BMI. Analysis of food consumption variables were evaluated according 24-hour dietary recall questionnaire at the three assessment moments and $p < 0.05$ was considered significant. Participants in each evaluation moments: Baseline (n = 122), 3 months (n = 117), 6 months (n = 113) and 1 year (n = 60).

Conclusion

- Later meal timing was associated with poor dietary patterns and a later first meal timing was associated to reduced weight loss at 1 year follow-up.
- These findings highlight the importance of considering meal timing in post-bariatric nutritional advising to optimize outcomes.

Acknowledgments

UFU Universidade Federal de Uberlândia

Lev
CENTRO AVANÇADO EM CONTROLE DO PESO

cronutri

Multidisciplinary bariatric surgery team

Uberlândia | Minas Gerais | Brazil

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Lev
Endoscopia & Controle da Obesidade

Chrononutrition group

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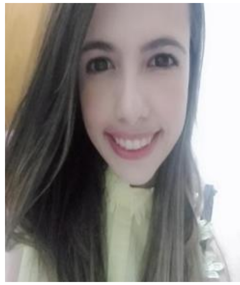



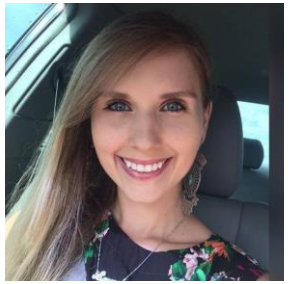








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