Obesity Surgery (2021) 31:2330–2334
https://doi.org/10.1007/s11695-020-05107-w

BRIEF COMMUNICATION

Nutritional Inadequacies Among Post-bariatric Patients During COVID-19 Quarantine in Sao Paulo, Brazil

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Received: 9 September 2020 / Revised: 4 November 2020 / Accepted: 9 November 2020 / Published online: 24 November 2020

Abstract

Post bariatric control of food intake is influenced by psychological and behavioral factors. We investigated dietary habits and food intake during COVID-19 quarantine among recently operated patients. Patients were assessed for total and per meal energy and macronutrient intake as well as frequency of food consumption per processing level. Patients were also classified according to adherence to nutritional recommendations from our outpatient clinic. Main results are indicative of inappropriate nutritional intake during COVID-19 quarantine in postoperative bariatric patients. We observed that many patients failed to meet the recommended protein intake (89.2%) along a relatively high intake of ultra-processed foods (~1/4 of the diet). Our data suggest the need for the implementation of strategies to extend nutritional care to at-risk patients during social distancing.

Keywords COVID-19 · Gastric bypass · Protein intake · Ultra-processed food · Nutritional status

It is well established that post-bariatric weight loss is mainly due to the dietary and gastrointestinal hormonal (such as satiety signals) adjustments imposed by surgery [1, 2]. However, postoperative control of food intake is also influenced by psychological and behavioral factors [3]. The outbreak of coronavirus disease 2019 (COVID-19) and social isolation measures taken worldwide to control the spread of the disease have dramatically changed the way of life among patients who underwent bariatric surgery, along with reduced access to face-to-face patient care [4]. In this scenario, adhering to postoperative dietary recommendations and maintaining appropriate control over dietary intake may be challenging. Considering these aspects, we investigated dietary habits and food intake during COVID-19 quarantine among patients who recently underwent bariatric surgery.

In this screening study, we enrolled patients who underwent bariatric surgery from the Metabolic and Bariatric Surgery Unit of the Clinical Hospital of the University of Sao Paulo, Brazil. Patients aged ≥ 18 years, with surgery elapsed time ≤ 12 months and without any COVID-19 symptoms, were considered eligible. Information about age, sex, surgery technique, postoperative time, and body mass index (BMI) were collected from medical records. Informed consent was obtained from all individual participants included in the study. Trained dietitians conducted three non-consecutive 24-h food recalls (two weekdays and one weekend day) over the phone to gather information on food consumption during quarantine. Using appropriate nutritional software (Dietbox software—online version), we analyzed energy (in kcal), protein, carbohydrates, and lipids (in grams and percentage of total energy intake—TEI) and fiber (grams) intake. Per meal (breakfast, lunch, dinner, and snacks) energy and macronutrients intake were also assessed. Food consumption was classified and calculated for processing level in accordance with the NOVA classification [5]. For this, we evaluated the frequency of food consumption (times/day) and energy contribution (%TEI) of each category (culinary ingredients; unprocessed or minimally processed foods; processed foods and ultra-processed foods).

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In addition, patients were categorically classified ("yes" or "no") according to their adherence to nutritional recommendations provided during follow-up in our outpatient clinic for patients who underwent bariatric surgery for the following criteria: meal skipping habit; daily consumption of three structured meals (breakfast, lunch, and dinner); consumption of snacks; consumption of animal and vegetal protein source in main meals (breakfast, lunch, and dinner); and minimal protein intake of 60 g/day [6]. Data are presented as mean ± standard deviation or frequency (absolute and relative). Data on food consumption are presented as absolute values, %TEI and daily frequency of intake.

We evaluated 65 patients (56 (86.1%) women) aged 47.2 ± 11.4 years. Forty-seven (72.3%) underwent Roux-en-Y gastric bypass, whereas 18 (27.7%) underwent vertical gastrectomy. Average postoperative time and BMI were 7.4 ± 2.2 months and 35.5 ± 6.8 kg/m^2, respectively. Twenty-one (32.3%) patients had the habit of skipping meals; thirty-four patients (52.3%) had daily consumption of three structured meals; and only twenty-three patients (38.5%) consumed animal protein in all main meals and thirty-seven (56.9%) consumed any source of protein (animal or vegetable) in all main meals (Table 1).

The average energy intake was 824.5 ± 255.4 kcal/day. The frequencies of unprocessed or minimally processed foods, processed foods, and ultra-processed foods consumption were 10.1 ± 2.9, 2.2 ± 1.1, and 3.1 ± 1.5 times/day, respectively. Energy from ultra-processed and processed foods corresponded to 23.8 ± 12.3% and 11.1 ± 10.1% of TEI, respectively (Table 2). We observed that most of the consumed protein was during lunch, whereas carbohydrate was mostly present during snacks (Fig. 1). In comparison to guideline recommendations, we observed that most patients (fifty-eight patients (89.2%)) did not achieve the recommended daily protein intake (animal + vegetal source). A representative 24-h recall from one of the patients is showed in Table 3.

Our results are indicative of inappropriate nutritional intake during COVID-19 quarantine in patients who underwent bariatric surgery. Despite current recommendations regarding the implementation (whenever possible) of telemedicine, online, or phone follow-up strategies during quarantine in order to provide health support, especially nutritional, to patients who are less willing or unable to travel [7], the emergency status of the pandemic impeded the implementation of remote follow-up in our institution. This is of clinical relevance, as inadequate eating practices and lifestyle arising from lack of nutritional guidance and counseling (as those experienced by our cohort due to constraints imposed by social isolation measures) may compromise the effectiveness of surgery on weight loss [8]. More than one-third of the patients had the habit of skipping main meals (breakfast, lunch, or dinner), which could possibly be related to an elevated consumption of snacks throughout the day. Considering the energy content of snacks (293.6 ± 196 kcal), their frequent consumption may lead to excessive calorie intake, which in turn could result in reduced weight loss or even weight recover in the postoperative period [9]. The rather low sugar intake observed in most of our patients (2.5% TEI) is not surprising. Previous studies have shown a decreased preference for sugar among patients undergoing bariatric surgery [10] as its highly osmotic feature increases the incidence of dumping syndrome [11]. Despite adequate dietary fiber intake being essential for gut function and laxation (bowel habits) [12], there is a lack of fiber intake recommendation in current guidelines [6, 13]. The number of available studies on post-bariatric dietary fiber intake is limited, but food intolerance to cereals, rice, fruits, and vegetables has been considered as a potential contributing factor to reduced postoperative fiber intake [14].

Protein is thought to play a central role in postoperative nutrition of bariatric patients. Current recommendations state that protein-rich foods (e.g., dairy products, eggs, fish, and lean meat) should be consumed in the main meals of the day [6]. We observed that many of our patients failed to meet both the recommended daily protein intake (89.2%) and the recommendation for frequent animal protein intake (38.5%). Inadequate protein intake has been previously reported in Brazilian patients undergoing bariatric surgery [15, 16]. Considering the relatively short postoperative time (7.4 ± 2.2 months), one may speculate that food intolerance may have hampered proper protein intake [17]; however, previous studies did not observe any association between food intolerance and protein consumption [15, 18]. Although speculative, the low protein ingestion may be related to our population's low socioeconomic status [19]. These results reinforce the importance of monitoring protein intake after surgery. No recommendation is currently available for per-meal protein

Table 1 Meal pattern behavior among post-bariatric patients ($n = 65$)

Eating three structured meals daily (breakfast, lunch, and dinner)	44 (67.7%)
Consuming five or more than five meals daily, including snacks	34 (52.3%)
Consuming animal protein source in main meals	25 (38.5%)
Consuming animal or vegetal protein source in main meals	37 (56.9%)
Number of meals/day	4.9 ± 1 (2–8)
According outpatients' dietitian advices	

Table 2 Post-bariatric patients' food intake ($n = 65$)

Daily nutrient consumption	
Energy (kcal/day)	824.5 ± 255.4 (385–1776.7)
Protein (g/day)	42.9 ± 13 (23.6–80.7)
Protein (%TEI)	21.5 ± 5.8 (12–40.6)
Carbohydrate (g/day)	112.6 ± 39.3 (34.6–245)
Carbohydrate (%TEI)	55.1 ± 10.9 (26.4–82.9)
Sugar (%TEI)	2.5 ± 4 (0–22.3)
Lipid (g/day)	33.3 ± 16.7 (13.4–136.6)
Lipid (%TEI)	36.2 ± 9.8 (18.1–69.2)
Fiber (g/day)	8.7 ± 4 (2–19.6)
Energy density (kcal/g)	1 ± 0.3 (0.5–1.9)
Food consumption per processing level	
Culinary ingredients (%TEI)	10.1 ± 5 (0–23.7)
Unprocessed or minimally processed foods (frequency)	10.1 ± 2.8 (5–19)
Unprocessed or minimally processed foods (%TEI)	54.9 ± 14.6 (13.7–86.4)
Processed foods (frequency)	2.2 ± 1.1 (1–6)
Processed foods (%TEI)	11. ± 10.1 (0–43.8)
Ultra-processed foods (frequency)	3.1 ± 1.5 (1–8)
Ultra-processed foods (%TEI)	23.8 ± 12.3 (2.5–71.6)

Data are shown as frequency (% of patients) or mean ± standard deviation (95% confidence interval). *TEI* total energy intake

intake in postoperative bariatric surgery; however, there is evidence to suggest that a high per-meal protein intake (> 30 g/meal) is associated with better functional status in older obese adults engaged in a weight loss intervention [20]. In our patients, average per meal protein intake was ~ 17 g. Reductions in fat-free mass during energy restriction typically account for a significant amount of total weight loss. This is also the case in patients who underwent bariatric surgery, for whom the loss of fat-free mass may rise as high as 23% within the first months after surgery [21] and may significantly impact functional capacity, bone remodeling, and cardiometabolic parameters [22]. In this scenario, adequate protein provision may constitute an important nutritional support to mitigate energy restriction-induced muscle waste.

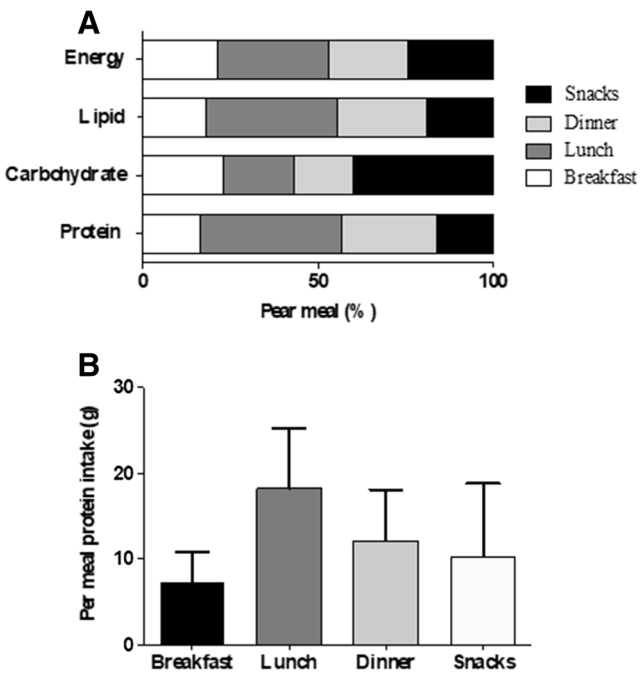

Fig. 1 Panel **a** Per meal macronutrient contribution (relative to total energy intake) (breakfast, lunch, dinner, and snacks) (%). Panel **b** Per meal (breakfast, lunch, and dinner) protein intake (g)

Moreover, no guideline is available for carbohydrate and lipid daily intakes during the postoperative period. Despite the last UpToDate Report [13] allude carbohydrate and lipid intakes of approximately 130 g/day and 20 to 35% TEI, respectively, these are not official recommendations; therefore, no adequacy assessment was performed.

Despite the high intake of unprocessed or minimally processed foods (predominantly in the form of natural foods), our patients showed a high consumption of ultra-processed foods (23.8 ± 12.3% of TEI). Because of its energy dense profile characterized by high fat (mainly saturated fat), sugar, and sodium levels, the ingestion of ultra-processed foods is strongly associated with obesity and cardiovascular disease [23]. Moreover, ultra-processed foods can activate brain regions associated with the reward system, affecting food choices and stimulating food consumption [24]. In line with this, previous studies have explored the caloric contribution as a function of food processing in patients who underwent bariatric surgery [25, 26]. Pinto et al. [25] observed that the caloric contribution of ultra-processed foods was 19.7% after 3 months of bariatric

Table 3 Representative 24-h recall and classification according to food processing level [5]

Meal/food	Amount	Food processing level
Breakfast		
Instant coffee	1 cup	Unprocessed or minimally processed
Whole milk	1 cup	Unprocessed or minimally processed
Sugar	1 medium spoon	Culinary ingredient
Bread	2 slices	Ultra-processed
Margarine	1 teaspoon	Ultra-processed
Lunch		
White rice	2 medium spoons	Unprocessed or minimally processed
Cooked beans	3 medium spoons	Unprocessed or minimally processed
Cooked chicken leg	1 medium piece	Unprocessed or minimally processed
Lettuce and tomato salad	3 medium spoons	Unprocessed or minimally processed
Instant juice, orange flavored	1 glass	Ultra-processed
Afternoon snack		
Tangerine	1 unit	Unprocessed or minimally processed
Dinner		
Cream cracker	4 small units	Ultra-processed
Ginger tea	1 cup	Unprocessed or minimally processed
Artificial sweetener	3 drops	Ultra-processed

surgery, which is ~20% lower than that seen in the current study. The qualitative analysis of food intake has become more important recently, as good-quality diets have been considered a protective factor against weight recovery after surgery [23]. It is possible, however, that the longer shelf life and lower cost of ultra-processed foods [27] may have driven its increased consumption during quarantine. Longitudinal assessments are warranted in order to confirm whether the nutritional inadequacies observed in this study are causally associated with social isolation and lack of face-to-face health care.

In conclusion, the screening of dietary habits and food intake during COVID-19 quarantine of patients who underwent bariatric surgery showed low protein consumption and a relatively high intake of ultra-processed foods (~ 1/4 of the diet). Despite the inherent limitations of an observational study, thus hampering more in-depth investigation of the actual role of COVID-19 pandemic on eating habits, data herein allow us to suggest the need for the development and implementation of virtual strategies, such as app-based tools and telemedicine, in order to extend nutritional care to at-risk patients during social distancing.

Funding This study was financially supported by the Sao Paulo Research Foundation (FAPESP) (grants #2015/26937-4, #2017/13552-2, #2019/18039-7, #2020/07860-9) and the National Council for Scientific and Technological Development (CNPq) (grant #402123/2020-4).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethics Approval and Consent to Participate This study has been approved by the Hospital's Ethical Committee. All patients gave their written consent for participation in the study.

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