Research Article

Predictive Factors of Weight Loss in a Group of Obese Tunisian Women

Abdesselem H[1,2]*, Harizi C[2,3], Amor NB[2,4], Mhidhi S[2,4], Jamoussi H[2,4], Sebai I[1,2], Ounaissa K[1,2], Fakhfakh R[2,3] and Amrouche C[1,2]

[1]Outpatient Department and Functional Explorations, National Institute of Nutrition, Tunis, Tunisia
[2]University of Tunis EL Manar, Faculty of Medicine of Tunis, 1007, Tunisia
[3]Department of Epidemiology and Statistics, Abderrahmen Mami Hospital, Ariana, Tunisia
[4]Obesity Research Unit, UR18ES01, National Institute of Nutrition, Tunis, Tunisia

*Corresponding author: Abdesselem Abbassi Haifa, Outpatient Department and Functional Explorations, National Institute of Nutrition, Tunis, Tunisia; University of Tunis EL Manar, Faculty of Medicine of Tunis, 11 Djebel Lakhdar Street- Bab Saâdoun-Tunis, Tunisia

Abstract

Aim: The aim of this study was to identify the predictors of a weight loss of more than 5% of the baseline weight in a group of Tunisian women with obesity.

Methods: Prospective study at the Obesity Research Unit of the National Institute of Nutrition of Tunis, including 73 adult women with obesity. After 6 months of lifestyle interventions, univariate and multivariate logistic regression analysis were performed to extract predictors of success of weight loss at 6-months.

Results: More than half of patients (57.5%) achieved a loss of ≥5% of body weight from baseline. Univariate analysis found that initial weight loss at one month (p $<10^{-3}$), potassium intake (p=0.010), phosphorus intake (p=0.012) and folate intake (p=0.025) were the factors associated with success of weight loss. The multivariate analysis showed that initial weight loss at one month (OR=2.369; p=0.02), TSH (OR=3.632; p=0.026) and dietary phosphorus intake (OR=0.995; p=0.011) were related to success of weight loss.

Conclusion: Larger-scale studies with long-term follow-up would be needed to better determine the predictors not only of success of weight loss but also of its long-term maintenance.

Keywords: Obesity; Weight loss; Dietetics

Introduction

The rapidly growing prevalence of obesity has become a major public health due to the multitude of complications it can lead to and its cost for public health [1].

In Tunisia, in 2005, the overall prevalence of obesity in subjects aged between 35-70 years was 25.40% (13.3% in men and 37% in women). According to the results of the Tunisian Health Examination Survey 2016 (THES-2016), the overall prevalence of obesity was 26.2% (34.6% in women and 17.6% in men) [2].

Although there are many approaches to achieving weight loss, nutritional care remains the cornerstone in the treatment of people with obesity.

In addition to weight loss, the managing goals of people with obesity are to reduce the risk of comorbidities and to improve their quality of life. Several studies have shown that a modest weight loss of 5-10% of the baseline weight is reported to have significant positive effects on comorbid conditions [3,4]. Nevertheless, many patients undergoing lifestyle interventions do not reach this goal.

The aim of this study was to identify the predictors of a weight loss of more than 5% of the baseline weight in a group of Tunisian women with obesity.

Subjects and Methods

Study design and participants

We conducted a prospective study at the Obesity Research Unit of the National Institute of Nutrition and Food Technologies of Tunis (INNTA) between October 2016 and March 2018.

We included adult women with obesity, aged between 18 and 65 years, with a body mass index (BMI) ≥30Kg/m². We did not include secondary obesity, pregnant and breastfeeding women as well as women using one or more drugs that may interfere with energy metabolism such as corticosteroids, neuroleptics.

Data collection

At baseline, we measured the anthropometric parameters (weight, height, BMI, Waist Circumference (WC) and impedancemetry) of all the women included.

We used the World Health Organization (WHO) classification of obesity: obesity class I (BMI = 30-34.9 Kg/m²), obesity class II (35-39.9 kg/m²) and obesity class III (BMI ≥40kg/m²) [5] and the standards of the International Diabetes Federation (IDF) in the Mediterranean population to define abdominal or visceral obesity, defined by a WC ≥80cm [6].

Physical activity was assessed using a simplified semi-quantitative questionnaire from the INNTA standard used for the screening and management of overweight and obesity in adults. Three levels of physical activity have been identified: high, medium or low.

A nutritional survey, using the software "NUTRISOFT, version 2.01, 1988", was conducted for all patients. Micronutrient intakes were assessed with reference to the nutritional intakes recommended by France's Food Safety Authority, the AFSSA in 2011.

Women included in the study have benefited from a psychological assessment.

A biological assessment was carried out on the day of recruitment of the patients, including Fasting Plasma Glucose (FPG), 75g Oral Glucose Tolerance Test (OGTT), uric acid dosage, TSH, Total Cholesterol (TC), Triglycerides (TG), HDL-Cholesterol (HDL-C). LDL cholesterol was calculated according to the FRIDEWALD formula: LDL-C (g/l) = [TC - HDL - TG/2.2 in mmol/l] × 0.387).

Intervention

The intervention aimed to encourage women with obesity to reduce or normalize their eating habits and to increase their physical activity.

All patients received personalized and adequate nutritional care involving a doctor, a nutritionist and a psychologist for 6 months. They benefited from personalized nutritional advice such as:

- Reduce total caloric intake

- Avoid very restrictive diets

- Divide the food intake into 3 main meals and a possible snack

- Respect the recommended intakes of the various macronutrients, favor the consumption of carbohydrates with low or medium glycemic index and limit those with high glycemic index.

- Limit the consumption of foods with high energy density, rich in lipids or sugars, limit the consumption of saturated and trans fats.

- Greater consumption of n-3 polyunsaturated fats

- Ensure a sufficient intake of dietary fiber (25-30 g/day), favor the consumption of vegetables and fruits.

- Drink enough water by limiting the consumption of sugary and alcoholic drinks.

- Diversify the diet based on equivalences and eat at set times, slowly, in a seated position.

For physical activity, all patients were advised to exercise moderate physical activity such as walking (30 to 60 minutes) daily or sports according to their choices. They were also advised to decrease sedentary activities such as sitting or lying down while watching television, sitting while driving a vehicle, sitting or lying down to read, or work at a desk or computer.

The psychologist accompanied the patients throughout their treatment by assessing emotional, socio-professional state and psychological problems that can impair the effectiveness of lifestyle intervention program, and looking for psychological factors that could promote eating disorders and/or resistance to treatment. Some patients have benefited from behavioral psychotherapy sessions when it was necessary.

Follow-up

We followed patients for 6 months with one follow-up visit per month. At each visit, anthropometric parameters were recorded, compliance with the dietary advice given during the first consultation were verified and corrections of any dietary errors were performed.

At the end of follow-up, we divided the patients into 2 groups according to the percentage of weight loss at 6 months in order to determine the predictive factors of success of weight loss:

Group 1 (G1): Women who lost ≥5% of baseline weight

Group 2 (G2): Women who lost <5% of baseline weight

Statistical methods

Data analysis was performed using SPSS 22.0. We calculated counts and percentages for the qualitative variables. Quantitative variables were expressed as means and Standard Deviations (SD).

A chi-square or Fisher's exact test were used to compare between the two independent groups: patients who achieved weight loss ≥5% of baseline weight, and those who did not achieve this goal. Student's t test was used to test the association between a qualitative variable and a quantitative one. In all statistical tests, the significance level was set at 0.05.

In order to identify the factors independently linked to weight loss, we conducted a multivariate analysis using logistic regression, taking as dependent variable the success of weight loss (≥5% of the initial weight) and as covariates the variables with univariate analysis test <0.2. The final returned variables were those significant at the level of 5%. Odds Ratio (OR) was presented with 95% Confidence Intervals (CI).

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki, after adequate understanding and written consent obtained from all the participants. Data confidentiality was respected.

Declarations of interest: none.

Results

General patient characteristics are summarized in Table 1.

The majority of patients (83.1%) had low physical activity. Most women had class III obesity (45.2%), while 27.4% had class I and class II obesity respectively. Table 2 summarizes the anthropometric measurements of the patients.

The average caloric intake was 2874.30 ± 717.89 Kcal/day. The metabolic profile of the patients is summarized in Table 3.

Participants lost an average of 5.92 ± 4.34 kg of body weight during the 6 months of follow-up. More than half of patients (57.5%) had achieved a loss of ≥5% of baseline weight.

According to the univariate analysis, initial weight loss at 1 month, potassium intake, phosphorus intake, and folate intake were found to be statistically related to success of weight loss for patients with obesity receiving lifestyle interventions (Table 4). All other general, anthropometric, metabolic characteristics, as well as other nutritional intake, eating disorders and physical activity level, were not significantly different between the two groups.

In multivariate analysis, the three independent variables associated with success of weight loss were initial weight loss at 1 month, TSH, and dietary phosphorus intake (Table 5).

Discussion

This study showed that independent variables associated with

Table 1: Characteristics of participants.

Age (years)	42.62±11.83
Menopause (%)	32.4
Age groups (%)	
18-30	18.3
31-40	25.4
41-50	23.9
51-65	32.4
Level of education (%)	
Illiterate	16.7
Primary	40.3
Secondary	27.8
University	15.3
Marital Status (%)	
Single	27.4
Married	67.1
Engaged	2.7
Widow	1.4
Divorced	1.4
Profession (%)	
Employee	22.9
Worker	7.1
Retired	1.4
Unemployed	68.6
Socio-economic level (%)	
Low	43.1
Medium	55.6
High	1.4
Tobacco (%)	0

Table 2: Anthropometric measurements of patients.

	Average ± SD	Minimum	Maximum
Weight (Kg)	103.35 ± 20.48	66.3	188
BMI* (Kg/m²)	39.98 ± 6.47	30	56.2
WC** (cm)	115.27 ± 15.71	83	158
BFM*** (%)	48.61 ± 13.87	26.7	95.1
FMI****	18.78 ± 4.66	11	30.7
LM***** (%)	54.72 ± 7.46	39.6	85.6

*Body mass index; **Waist circumference; ***Body fat mass; ****Fat mass index; *****Lean mass.

success of weight loss were initial weight loss at 1 month (p=0.02), TSH (p=0.026) and dietary phosphorus intake (p=0.011).

Several studies have sought to identify predictors of weight loss at 6 months or 12 months depending on the study.

The impact of initial weight loss on long-term weight loss is well described in several studies. In a Croatian study published in 2014, the predictors of success of weight loss (defined as weight loss ≥5%) at 12 months were marital status and initial weight loss at 1 month (P

Table 3: Metabolic profile of patients.

	Average ± SD	Minimum	Maximum
SBP* (mmHg)	12.52 ± 1.84	10	18
DBP** (mmHg)	7.39 ± 1.05	5	10
Total cholesterol (mmol/l)	4.91 ± 0.85	2.94	7.46
Triglycerides (mmol/l)	1.30 ± 0.70	0.46	3.93
HDL-Cholesterol (mmol/l)	1.25 ± 0.25	0.85	2.09
LDL-Cholesterol (g/l)	1.25 ± 0.31	0.62	2.21
Uric acid (µmol/l)	304.08 ± 79.05	153	683

*Systolic blood pressure; **Diastolic blood pressure.

Table 4: Parameters in patients who achieved adequate weight loss and those who did not achieve this goal.

	Weight loss ≥ 5%	Weight loss < 5%	P
Weight loss at 1 month (Kg)	3.44±1.75	1.85±1.55	<10⁻³
Obesity class			
Class I	10 (23.8%)	10(32.3%)	
Class II	16 (38.1%)	4(12.9%)	0.058
Class III	16 (38.1%)	17(54.8%)	
TSH (µUI/)	2.23±1,12	1.73±0,89	0.055
Potassium intake	2939.51±1006.56	3607.42±939.56	0.010
Phosphorus intake	1164.03±250.70	1344.40±290.66	0.012
Folate intake	168.58±81.19	214.59±74.14	0.025

Table 5: Multiple logistic regression evaluating predictive factors of success of weight loss.

Variables	OR (exp β)	Confidence interval	P
Weight loss at 1 month	2.369	[1.142-4.914]	0.02
TSH	3.632	[1.165-11.326]	0.026
Phosphorus intake	0.995	[0.991-0.999]	0.011

<0.001). Initial weight loss at 1 month made the strongest and only contribution to predicting percent weight loss at 12 months, while being married was a negative predictor [7].

Several studies concluded that weight loss during the first weeks of management was a predictor of success in weight loss or in its maintenance [8,9]. In the study of Fabricatore A et al., weight loss during the first 3 weeks of treatment (p <0.001), lower frequency of baseline depressive symptoms (p=0.04) and Caucasian ethnic origin (p=0.04) were found to be consistent predictors of success of weight loss (≥5% of the baseline weight) at 1 year [10].

In another study, greater weight loss over 12 weeks, having a job, lower mental Health-Related Quality of life (HRQL) and being older, predicted greater weight loss after 1 year in patients with morbid obesity, after an intensive lifestyle intervention program [11].

In this study, we found that baseline TSH was a predictor of success of weight loss. It is well known that thyroid dysfunction, including hyperthyroidism and hypothyroidism, leads to significant changes in body weight. However, whether thyroid hormones within the physiological range determine the amount of weight loss is not well elucidated and results of observational studies are controversial. The study of Gang Liu et al, conducted among overweight or obese

individuals with normal thyroid function, demonstrated that higher baseline free T3 and free T4 levels were significantly associated with a greater weight loss during the first 6 months (P<0.05) after multivariate adjustments including dietary intervention groups and baseline body weight. In contrast, TSH levels did not predict weight loss or weight regain in this analysis [12]. More research is warranted to clarify the underlying mechanism between normal thyroid hormone function and body weight change, especially among individuals with obesity.

In this work, univariate analysis demonstrated that initial folate intake (p=0.02) was a predictor of weight loss but it was not confirmed in multivariate analysis.

The study by Gorgojo Martınez et al., focused on the predictive factors of a weight loss ≥10% of initial weight after 1-year follow-up of subjects with obesity benefiting from a management program based on nutritional care and pharmacological management. In this study, after 12 months of follow-up, 21 subjects (11.5% of the initial cohort) had lost ≥10% of their initial weight. In this study, elevated serum folic acid was the only independent predictor of weight loss at 1 year. A 1ng/ml increase in serum folate increased the chance of success by 28% (adjusted odds ratio: 1.28; 95% CI 1.04-1.58) [13].

The present study has both strengths and weaknesses. The strength of our study was the follow-up of patients for 6 months. Some limitations should also be discussed: the small size of the sample, all participants were women and included from one center, which may reduce generalizability to all patients with obesity.

Conclusion

Socio-demographic, anthropometric, nutritional and metabolic characteristics were examined as possible predictors of weight loss of more than 5% of baseline weight after 6-months lifestyle intervention and follow-up. We found that initial weight loss at 1 month, TSH and dietary phosphorus intake had a direct effect on success of weight loss at 6-months.

A structured lifestyle intervention program designed for weight loss (lifestyle therapy) consisting of a healthy meal plan, physical activity, and behavioral interventions should be available for every person with obesity, ideally in specialized centers and executed by a multidisciplinary team that includes doctors, dietitians, educators, physical activity trainers or coaches, and clinical psychologists.

Larger-scale studies with long-term follow-up would be needed to better determine the predictors not only of success of weight loss but also of its long-term maintenance, which has become the major challenge.

Highlights

- Obesity has become a major public health.

- Although there are many approaches to achieving weight loss, nutritional care remains the cornerstone in the treatment of people with obesity.

- Initial weight loss at 1 month, TSH and dietary phosphorus intake has a direct effect on success of weight loss at 6-months.

Author's Contribution

Haifa Abdesselem: Conceptualization, Formal analysis, Writing - original draft; Chahida Harizi: Methodology; Formal analysis; Sana Mhidhi: Data curation; Nadia Ben Amor: Data curation; Henda Jamoussi: Data curation, Supervision; Validation; Imen Sebai: Visualization, Supervision; Kamilia Ounaissa: Supervision; Validation; Radhouane Fakhfakh: Writing - review & editing; Chiraz Amrouche: Writing - review & editing.

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