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Beneficial effects of *Aloe ferox* on lipid profile, blood pressure, and glycemic control in obese persons

A CONSORT-clinical study

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Abstract

Background: *Aloe ferox* is one of the most widely used medicinal plants today, with the most intense detoxifying action of all aloe species, being used in the treatment of various diseases, including obesity. Our study aimed to assess the efficacy of *Aloe ferox* in obesity treatment.

Methods: The study sample included 20 Romanian persons with obesity treated with diet and *Aloe ferox* based supplements, and 20 Romanian matched controls treated with diet and a placebo. The treatment included 2 capsules/day (*Aloe ferox* 460 mg) for 2 weeks, followed by a 2-week break, repeated 3 times. The blood pressure (systolic and diastolic) and anthropometric parameters, such as body mass index (BMI), total cholesterol, and abdominal circumference, as well as the biochemical parameters, fasting blood glucose (FBG), uric acid, and lipid profile was evaluated at baseline and after 3 months.

Results: After 3 months of *Aloe ferox* administration, significant differences between the study group and the control group were observed regarding BMI ($P = .03$), total cholesterol ($P = .032$), low-density lipoprotein cholesterol (LDLc) ($P = .01$) and FBG ($P = .018$). Also, between the initial clinical, anthropometric, and biological parameters and those after the administration of *Aloe ferox* in the study group, we obtained significant differences regarding BMI ($P = .002$), LDLc ($P = .039$), fasting glycemia ($P < .001$) and diastolic blood pressure ($P = .006$).

Conclusions: The administration of *Aloe ferox* to obese patients has been shown to achieve a significant reduction in body weight, BMI, LDLc, and FBG. These effects may be due to the laxative and detoxifying action of *Aloe ferox* components. As it can only be administered for limited periods due to side effects, further experimental and human studies of the efficacy of this plant in the treatment of obesity are needed.

Abbreviations: BMI = body mass index, BP = blood pressure, FBG = fasting blood glucose, HDLc = high-density lipoprotein cholesterol, LDLc = low-density lipoprotein cholesterol, TC = total cholesterol, TG = triglycerides.

Keywords: *aloe ferox*, body mass index, cholesterol, fasting blood glucose, obesity

1. Introduction

In the last few years, obesity became a public health problem. The worldwide prevalence of obesity is increasing, in 2016, 13% of the world's adult population (11% of men and 15% of women) were obese and 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight. The prevalence of obesity nearly tripled between 1975 and 2016.[1]

Editor: Flavio Palmieri.

The study was approved by the Institutional Ethics Committee (The Ethics Committee of the Emergency Hospital, Timisoara), Number 52083/2019.

Consent for publication was not applicable.

Funding was not applicable.

The authors have no conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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How to cite this article: Gherbon A, Frandes M, Timar R, Nicula M. Beneficial effects of Aloe ferox on lipid profile, blood pressure, and glycemic control in obese persons: a CONSORT- clinical study. Medicine 2021;100:50(e28336).

Received: 10 September 2021 / Received in final form: 12 November 2021 / Accepted: 30 November 2021

http://dx.doi.org/10.1097/MD.0000000000028336

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. It is appreciated through body mass index (BMI), but it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals.[1] The main cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. This happens because of an increased intake of energy-dense foods that are high in fat, and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization.[1] Increased BMI represents a major risk factor for cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders (especially osteoarthritis), some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon).[1] Despite the diet and exercise used for losing and maintaining weight, in the last years more and more people used complementary and alternative medicine for obesity treatment. From herbal supplements, the most used are Kelp Seaweed,[2]*Garcinia Cambogia*, *Camellia Sinensis*, *Hoodia Gordonii*, *Cynachum Auriculatum*, etc..[3]

In Romania, due to the absence of an adequate treatment of obesity, and due to the increase of its prevalence, besides diet and physical exercise, more and more people used natural medication. It is based on the use of plants such as artichokes, cherries, corn silk, chicory, psyllium, flax, wild carrot, etc., with diuretic, laxative, detoxifying action. In recent years, natural weight loss preparations that appeared in Romania contain a plant called *Aloe ferox*.

Aloe Ferox is one of the most widely used medicinal plants today and, at the same time, it is one of the most famous medicinal herbs of all time. *Aloe ferox* is also called bitter Aloe because it has a bitter taste and, at the same time, the most intense detoxifying action of all aloe species. Other names under which it is also known are Cape aloe, Red aloe, and Tap aloe. *Aloe ferox* contains aloins named Barbaloin, Aglyka, Aloe-emodin, and Chrysophanol, and 2-alkylchromones named Aloeresins. These substances seem to have laxative effects.[4,5]*Aloe ferox* is also the most used variety in South Africa (which is the area of origin of all aloe species), but also in Japan, China, Korea. It is used in the treatment of various diseases such as gout, colon cancer, skin cancer, thrombophlebitis, to stimulate immunity, treatment of diabetes, rheumatism, lung cancer, leukemia, digestive candidiasis, and obesity.[6]

In literature, there are no studies about the effectiveness of *Aloe ferox* on humans concerning obesity, lipid profile, or glycemic control, but only on animals. Most studies investigated the anti-obesity and antidiabetic effects of diet-supplemented *Aloe ferox* extracts in rats. Male Wistar rats were made obese by feeding a high-fat diet, then assigned to three groups: the control group, the group treated with diet, and the group treated with *Aloe ferox*. In the group treated with *Aloe ferox* extract, it was observed a significantly reduced body weight, fat pads and liver weight, and blood glucose levels compared to the control and diet group.[7]

Some herbal preparations used in obesity include anthraquinones containing plants, such as senna (Cassia species), cascara (Rhamnus species), rhubarb (*Rheum palmatum*), and Aloe (*Aloe vera*, *Aloe ferox*). The laxative effect of anthraquinones leads to rapid excretion of foods and water loss which can aid in weight reduction.[8] Also, some studies on rats showed antidiabetic activity through potential inhibition of α-glucosidase, with little effect on α-amylase inhibition in vitro assays.[9] *Aloe ferox* supplementation similarly resulted in moderately increased serum insulin, accompanied by slight corrections in ALP and HDL-C, without any change to end-point plasma glucose values.[10] Other studies investigated the toxicity of *Aloe ferox* on rats. These received graded dose levels, 50, 100, 200, and 400 mg/kg body weight of aqueous leaf extract of *Aloe ferox* for 3, 14, and 35 days. *Aloe ferox* is relatively non-toxic if not used for few days such as 3 days of the acute toxicity test. The plant, at the highest dose level tested, did not cause any rat mortality, physiological or behavioural change in the acute, sub-acute and chronic toxicity tests. However, the plant should not be excessively used as this could lead to the damage of the heart, lungs and kidneys, and degeneration of spermatogenic cells.[11] As the action of different plants on lipid profile, polyunsaturated fatty acids, linoleic acid (C18:2 n-6), and linolenic acid (C18:3 n-3), were better represented in *Aloe spectabilis*, *Aloe arborescence* and *Aloe ferox* leave with beneficial effects on it.[12]

The objective of the present study was to investigate the effectiveness of *Aloe ferox* administered in capsule form for the treatment of obesity and its beneficial effects on lipid profile, blood pressure, and glycemic control in obese persons, not studied before.

2. Methods

2.1. Study design

This study was a randomized placebo-controlled study, double-blind, including 40 volunteers' persons with obesity, aged more than 18 years old. The study was parallel one, and the sample included 20 Romanian persons with obesity treated with diet and *Aloe ferox* capsules, while the control group consisted of 20 Romanian patients with obesity treated with diet and a placebo The treatment with *Aloe ferox* was performed with 2 capsules/day for 2 weeks, followed by a 2-week break, repeated 3 times. The capsules contained 460 mg *Aloe ferox* crystallized juice powder/1 gelatin capsule (prepared *Aloe ferox* - Herbagetica). The dose was set at 2 capsules/d, one in the morning and one in the evening. When the dose was increased to 3 capsules/d, frequent diarrhea occurred. The duration of the cure was set at 2 weeks, with a 2-week break, repeated 3 times, due to the increasing effect of diuresis with the possibility of hypokalemia.

The randomization was simple, implemented using a computer software program that generates the random sequence (odd numbers for the control group and even numbers for the other group).

2.2. Patients

All included patients signed written consent. Our study was approved by the Institutional Ethics Committee (The Ethics Committee of the Emergency Hospital, Timisoara), Number 52083/2019 and it was conducted in accordance with the World Medical Association Code of Ethics (Helsinki Declaration 1975). The manuscript was prepared in accordance with CONSORT guidelines for clinical studies. All data were anonymized before analysis. The inclusion criteria consisted of:

- age more than 18 years,
- presence of obesity,
- absence of gastrointestinal disorders: intestinal obstruction, acute intestinal inflammation (Crohn's disease, ulcerative colitis), ileus, acute surgical abdomen, chronic constipation, appendicitis, abdominal pain of unknown etiology).

- absence of renal failure

while the exclusion criteria consisted of:

- pregnant or breastfeeding women
- diarrhea
- treatment with diuretics
- the presence of an active/untreated psychiatric disease.

The methods of investigation were represented by clinical, anthropometric, and laboratory data.

2.3. Clinical, anthropometric, and laboratory data

We determined anthropometric parameters such as height, weight, BMI, abdominal circumference, blood pressure; biochemical parameters: fasting blood glucose, lipid profile (total cholesterol (TC)–high-density lipoprotein [HDLc], low-density lipoprotein [LDLc], and triglyceride).

Body mass index (BMI) was computed with the following formula: actual weight/height^2. Bodyweight was measured to the nearest 0.5 kg, and body height to the nearest 0.1 cm. We considered as overweight a BMI between 25 to 29.9 kg/m^2 and as obesity a BMI $\geq$ 30 kg/m^2. Abdominal circumference was measured with a centimeter and was considered normal values $<$ 80 cm for females and $<$ 94 cm for males. Determination of plasma glucose was performed by enzyme technique with glucose oxidase. We considered normal values for fasting glucose, values between 70 to 110 mg%, and for postprandial glycemia, values below 140 mg%.

Lipid profile was assessed by spectrophotometric method (enzymatic-colorimetric) and were considered normal values of TC $<$ 200 mg/dl, triglycerides $<$ 150 mg/dl, LDLc $<$ 100 mg/dl and HDLc $>$ 50 mg/dl for female and $>$ 40 mg/dl for male.

Blood pressure (BP) was measured in the sitting position from the left upper arm after the subjects have rested for 5 to 10 minutes. We used a conventional sphygmomanometer (Disytest, Germany) with an appropriate bladder size. Systolic BP (SBP) was determined as the average of the two measurements within 10 minutes. According to the European Guidelines on Cardiovascular Disease Prevention in Clinical Practice (2016), we considered hypertension blood pressure $>$ 140/90 mm Hg.[13] All these parameters were measures for all the patients at the beginning of the study before they begin the diet and the treatment with *Aloe ferox*, and then after three months of treatment.

Because three patients presented diarrhea and abdominal pain, they renounced at *Aloe ferox* administration.

2.4. Statistical analysis

Data were analysed using the SPSS v.20 software (SPSS Inc., Chicago, IL). The threshold for statistical significance was a *P*-value $<$ .05, and a value of 0.95 was the confidence level for estimating intervals.

Continuous data normally distributed (following a Gaussian distribution) were presented as mean and standard deviation, while continuous data following other distributions were described as median and interquartile range. Nominal data were described as absolute frequency and percentage. The normality of continuous data distributions was verified by applying the Kolmogorov–Smirnov test, while the equality of variances was tested using Levene test.

The significance of the differences between groups of patients treated with *Aloe ferox* and the group treated with placebo was assessed using the Student *t*-test, in the case of Gaussian populations, while the Mann–Whitney *U* test was used in the case of non-Gaussian populations. To assess the statistical significance of the difference between percentages, the Pearson chi-square or Fisher exact test was employed. For comparison of more than two groups of patients, one-way ANOVA for continuous variables with Gaussian distribution or Kruskal-Wallis *H* test for continuous variables with non-Gaussian distribution was applied.

3. Results

Our sample included 20 (12 F and 8 M) persons with obesity treated with diet and supplements of *Aloe ferox*, aged between 50 and 70 years (mean 60.4 $\pm$ 7.11 years). The control group included 20 (13 F and 7 M) persons with obesity treated with diet and a placebo, having similar age. The baseline characteristics of both groups are presented in Table 1.

We observed that there were no significant differences between the baseline characteristics of the group of persons with obesity

Table 1

Baseline characteristics of the studied groups.

Parameters	*Aloe ferox* (*n* = 20)	Placebo (*n* = 20)	*P* value
Actual age (yr)*	60.40 $\pm$ 7.11	60.40 $\pm$ 6.93	.999
Gender (M)†	8 (40%)	7 (35%)	.715
BMI (kg/m^2)*	34.45 $\pm$ 3.95	34.19 $\pm$ 3.66	.831
AC (cm)*	114.72 $\pm$ 10.04	109.70 $\pm$ 10.55	.131
TC (mg %)*	174.10 $\pm$ 39.47	193.50 $\pm$ 38.22	.122
HDLc (mg %)*	44.48 $\pm$ 8.68	45.84 $\pm$ 6.47	.578
LDLc (mg %)*	96.93 $\pm$ 35.98	118.42 $\pm$ 35.44	.064
TG (mg %)*	163.45 $\pm$ 77.68	146.18 $\pm$ 53.23	.417
Fasting glycemia (mg%)	103.4 $\pm$ 5.88	102.80 $\pm$ 5.28	.736
Uric acid (mg%)	6.11 $\pm$ 1.65	6.26 $\pm$ 1.13	.734
Systolic blood pressure (mm Hg)	136.00 $\pm$ 17.51	139.75 $\pm$ 23.08	.566
Diastolic blood pressure (mm Hg)	80.50 $\pm$ 10.50	81.75 $\pm$ 13.00	.739

* Continuous variables (with gaussian distribution) are indicated by their mean ($\pm$ st.dev.).

† Categorical variables are presented by percentage (absolute frequency) in the sample.

AC = abdominal circumference, BMI = body mass index, HDLc = high-density lipoprotein cholesterol, LDLc = low-density lipoprotein cholesterol, TC = total cholesterol, TG = triglycerides.

Table 2

Comparative description of patients with obesity treated with diet supplemented with *Aloe ferox* (before vs. after).

Parameters	Before (n = 20)	After (n = 17)	*P* value
BMI (kg/m2)	34.45 ± 3.95	30.94 ± 2.56	**.002**
AC (cm)	114.72 ± 10.04	110.50 ± 10.29	.217
TC (mg %)	174.10 ± 39.47	154.52 ± 28.87	.091
HDLc (mg %)	44.48 ± 8.68	48.88 ± 8.48	.129
LDLc (mg %)	96.93 ± 35.98	74.44 ± 27.81	**.039**
TG (mg %)	163.45 ± 77.68	156.00 ± 76.81	.771
Fasting glycemia (mg %)	103.40 ± 5.88	94.35 ± 4.59	**<.001**
Uric acid (mg%)	6.11 ± 1.65	5.90 ± 1.46	.677
Systolic blood pressure (mm Hg)	136.00 ± 17.51	127.94 ± 15.41	.145
Diastolic blood pressure (mm Hg)	80.50 ± 10.50	71.47 ± 8.43	**.006**

[a]Continuous variables (with Gaussian distribution) are indicated by their mean (± st.dev).

[b]Categorical variables are presented by percentage (absolute frequency) in the sample.

AC = abdominal circumference, BMI = body mass index, HDLc = high-density lipoprotein cholesterol, LDLc = low-density lipoprotein cholesterol, TC = total cholesterol, TG = triglycerides.

treated with diet and supplements of *Aloe ferox* and the placebo group. When considering the group of persons treated with *Aloe ferox*, we observed that the three months of treatment significantly lowered the BMI (34.45 ± 3.95 vs 30.94 ± 2.56; $P = .002$), LDLc (96.93 ± 35.98 vs 74.44 ± 27.81; $P = .039$), fasting glycemia (103.4 ± 5.88 vs 94.35 ± 4.59; $P < .001$), and diastolic blood pressure (80.5 ± 10.5 vs 71.47 ± 8.43; $P < .006$) (Table 2).

The main side effects reported in the literature after aloe ferox administration are: diarrhea, abdominal pain and cramps, potassium depletion, kidney disease (acute renal failure), hematuria, liver problems (rare), muscle weakness, weight loss, cardiovascular disease especially in association with some drugs used to treat them. Because three patients presented diarrhea and abdominal pain, they renounced at *Aloe ferox* administration, and they were excluded from the study. As a result, the following parameters were also monitored: blood ionogram (sodium, potassium), renal function (urea, creatinine), liver function (liver transaminases (alanine aminotransferase, aspartate aminotransferase), bilirubin, cholinesterase), coagulation tests. The values obtained for the monitored parameters are listed in Table 3. All monitored parameters were kept within normal limits after each round of administration.

After three months of treatment, we observed that the placebo group presented no significant changes in lipid profile, neither in blood pressure, excepting the fasting glycemia, which significantly lowered after the treatment (Table 4).

After three months of treatment, the group of persons with obesity treated with diet supplements with *Aloe ferox* presented lower BMI (32.2 ± 3.85 vs 30.94 ± 2.56; $P = .03$), TC (154.35 ± 26.56 vs 154.52 ± 28.87; $P = .03$), LDLc (75.7 ± 26.13 vs 74.44 ± 27.81; $P = .01$) and fasting glycaemia (94.1 ± 4.33 vs 94.35 ± 4.59; $P = .02$) than the control group. On the contrary, the blood pressure did not present significant changes after three months of treatment (Table 5).

4. Discussions

After three months of *Aloe ferox* administration, significant differences between the control group and the study group were obtained regarding BMI, TC, LDLc, and fasting blood glucose. Also, between the initial clinical, anthropometric, and biological parameters and those after the administration of *Aloe ferox* in the study group, we obtained significant differences regarding BMI, LDLc, fasting glycemia, and diastolic blood pressure.

Table 3

Parameters monitored during the treatment with *Aloe ferox*.

Parameters	Normal value	I	II	III
Blood ionogram				
Na^+	135–145 mmol/l	139.95 ± 3.39	140.88 ± 3.07	139.70 ± 3.56
K^+	3.5–5 mmol/l	4.29 ± 0.43	4.27 ± 0.47	4.22 ± 0.46
Renal function				
urea	15–36 mg/dl	24.9 ± 6.51	24.76 ± 7.22	23.58 ± 6.13
creatinine	0,7–1,2 mg/dl	0.97 ± 0.17	0.93 ± 0.16	0.95 ± 0.17
Hepatic function				
ASAT	14–36 U/l	24.4 ± 7.08	25.17 ± 7.87	23.05 ± 6.84
ALAT	0–35 U/l	13.5 ± 5.91	21.41 ± 13.28	25.88 ± 8.10
TB	0–1 mg/dl	0.49 ± 0.33	0.58 ± 0.30	0.47 ± 0.35
cholinesterase	4650–10440 U/l	4699.5 ± 5.91	4718 ± 5.04	4678 ± 5.04
Coagulation tests				
APTT	25.1–36.5 s	30.05 ± 0.59	31.9 ± 0.50	27.9 ± 0.50
PT	9.4–12.5 s	11.15 ± 0.59	10.55 ± 1.08	11.25 ± 1.14
INR	0.8–1.07	0.95 ± 0.08	0.92 ± 0.05	0.93 ± 0.10

ALAT = alanine aminotransferase, APTT = partly activated thromboplastin time, ASAT = aspartate aminotransferase, INR = International Normalized Ratio, K = potassium, Na = sodium, PT = prothrombin time, TB = total bilirubin.

Table 4

Comparative description of patients with obesity treated with placebo (before and after).

Parameters	Before	After	*P* value
BMI (kg/m^2)*	34.19 ± 3.66	33.32 ± 3.73	.460
AC (cm)	109.70 ± 10.55	108.70 ± 10.55	.766
TC (mg %)*	193.50 ± 38.22	178.70 ± 37.23	.222
HDLc (mg %)*	45.84 ± 6.47	48.55 ± 6.28	.187
LDLc (mg %)*	118.42 ± 35.44	101.93 ± 34.38	.143
TG (mg %)*	146.18 ± 53.23	141.10 ± 45.97	.748
Fasting glycemia (mg%)	102.80 ± 5.28	98.40 ± 5.32	**.012**
Uric acid (mg%)	6.26 ± 1.13	5.95 ± 1.06	.375
Systolic blood pressure (mm Hg)	139.75 ± 23.08	133.50 ± 20.90	.375
Diastolic blood pressure (mm Hg)	81.75 ± 13.00	75.25 ± 13.12	.123

* Continuous variables (with Gaussian distribution) are indicated by their mean (± st.dev.).

[b]Categorical variables are presented by percentage (absolute frequency) in the sample.

AC = abdominal circumference, BMI = body mass index, HDLc = high-density lipoprotein cholesterol, LDLc = low-density lipoprotein cholesterol, TC = total cholesterol, TG = triglycerides.

The effects on body weight and BMI are due to the laxative and detoxifying action of *Aloe ferox*. Usually, any remedy catches only in some patients, exerting its therapeutic action on them, while in others it does not affect. In the case of constipation, the action of this plant is amazingly wide, these effects appearing in more than 70% of those who took the crystallized extract. This is because aloe stimulates intestinal peristalsis, stimulates the secretion of digestive juices, normalizes the flora in the colon, greatly accelerating intestinal transit. Aloe dried juice contains Aloe-emodin-9-anthrone which acts specifically on the colon and has laxatives properties.[14]

In ESCOP monograph is mentioned a study in 6 healthy volunteers.[15] In this study, aloes were administrated orally for 7 days, and aloe-emodin was detected as a metabolite in the plasma only sporadically and with maximum concentrations of less than 2 ng/ml. Koch (1995) evaluated the laxative effect of aloin in experiments on herself. She found that the administration of aloin or increasing the dose does not have a laxative effect, but Aloin was found in the feces. The author also studied the use of aloe as a laxative in 3 patients given 50 mg aloin in a gelatin capsule at 8 p.m. The author concluded that the laxative effect depends on the cleavage of aloin in aloe-emodin.[16]

It is indicated to use only for short periods because due to the laxative effect it can cause the appearance of an atonic colon and aggravation of constipation. A series of studies performed on human subjects have shown that the administration of laxatives can lead in time to damage to enteric nerves, smooth muscle atrophy; distension or ballooning of axons, reduction of nerve-specific cell structures and increase in lysosomes, and sometimes a total degeneration of whole nerve fibers; short-lived superficial damage to the mucosa. However, they can also be determined by constipation itself or pre-existing changes of unknown etiology.[17–22]

Other studies have shown that impairment of the autonomic nervous system of the colon is not very well documented experimentally.[23] A study conducted on 11 matched pairs only on the morphology of the autonomic nervous system of constipated patients taking anthraquinones (Aloe) to that of an appropriate control group of constipated patients without laxative intake[24] did not support the hypothesis that anthraquinone-containing laxatives are able to provoke relevant degenerative changes in the colonic nerve tissue.

Five substances found in aloe, called phytosterols, have very strong effects against diabetes. Japanese researchers have shown, through an experimental medicine study done in 2006, that 50 ml. of aloe gel administered daily leads to lowering and stabilizing blood sugar.[25] Another research on human patients, conducted in hospitals in India in 2008, showed that only two aloe capsules (500 mg each), administered daily, stop the evolution of type II diabetes.[26]

Table 5

Comparative description of patients with obesity treated with diet supplemented with *Aloe ferox* vs supplemented with placebo, after three months of treatment.

Parameters	*Aloe ferox* (n = 17)	Placebo (n = 20)	*P* value
BMI (kg/m^2)	30.94 ± 2.56	32.20 ± 3.85	**.030**
AC (cm)	110.50 ± 10.29	111.95 ± 10.08	.603
TC (mg %)	154.52 ± 28.87	154.35 ± 26.56	**.032**
HDLc (mg %)	48.88 ± 8.48	49.00 ± 8.60	.894
LDLc (mg %)	74.44 ± 27.81	75.70 ± 26.13	**.010**
TG (mg %)	156.00 ± 76.81	148.25 ± 73.41	.490
Fasting glycemia (mg %)	94.35 ± 4.59	94.10 ± 4.33	**.018**
Uric acid (mg%)	5.90 ± 1.46	5.83 ± 1.61	.897
Systolic blood pressure (mm Hg)	127.94 ± 15.41	127.25 ± 14.37	.359
Diastolic blood pressure (mm Hg)	71.47 ± 8.43	70.75 ± 8.15	.298

[a]Continuous variables (with Gaussian distribution) are indicated by their mean (±st.dev.).

[b]Categorical variables are presented by percentage (absolute frequency) in the sample.

AC = abdominal circumference, BMI = body mass index, HDLc = high-density lipoprotein cholesterol, LDLc = low-density lipoprotein cholesterol, TC = total cholesterol, TG = triglycerides.

The dried latex of the aloe plant (aloes) is one of several traditional remedies used for diabetes in the Arabian Peninsula. Its ability to lower blood glucose was studied in 5 patients with non-insulin-dependent diabetes and in Swiss albino mice made diabetic using alloxan.[27]

Due to the weight loss, the value of TC, LDLc, and TAD also improved. Thus, a study performed on 173 obese and overweight participants showed a significant reduction in CT, LDLc, and triglycerides after weight loss through diet and exercise.[28] Other studies show the effect of weight reduction on blood pressure. For example, a study performed on 490 obese hypertensive patients show that weight loss with 5% normalized BP levels.[29]

Although bitter plants generally stimulate appetite, aloe softwoods have the opposite effect, with most people decreasing their appetite for food, especially when administered systematically for longer periods of time. Experimental medicine studies have shown that the administration of crystallized aloe extract leads to the burning of more calories by the body, due to digestive processes, elimination processes, etc.[30] In addition, the administration of crystallized aloe increases the production of collagen in the body, as shown by a recent Korean study.[31] Or collagen is what gives elasticity to the skin and helps us not to look unsightly, as if our skin remained wide, after losing weight fast. Everything is for this plant to be administered in time, that is, during the period of weight loss, and systematically.[31] However, it should be borne in mind that this remedy is taken in moderate doses and correlated with a balanced diet, with fewer calories. In the West, there is a fashion for the administration of large quantities of this plant, which produces a strong purgation, which will lead to a very sudden decrease, really spectacular, in weight, but associated with dehydration, with the loss of potassium and magnesium, with imbalances which can go as far as hypotension, cardiac arrhythmias.

Prolonged use of aloe-containing preparations is associated with watery diarrhea leading to electrolyte imbalance and the increased loss of potassium can lead to hypokalemia.[32] Also, hypokalemia and the increased loss of potassium may increase the activity of cardiac glycosides and interfere with the action of anti-arrhythmic agents (interaction with antiarrhythmic medicinal products, which induce reversion to sinus rhythm, e.g., quinidine) and medicinal products inducing QT-prolongation.[33] Concomitant use with medicinal products inducing hypokalemia (e.g., diuretics, adrenocorticosteroids, and liquorice root) may aggravate electrolyte imbalance. Like other substances, also *Aloe ferox* can determine the occurrence of acute or chronic diseases, depending on the dose, the administration duration, and the reaction of the body.[34]

One of these plants' side effects is hepatic and renal insufficiency. In literature is described a case of a 47 years old man from Soweto, South Africa who developed acute oliguric renal failure and liver dysfunction after ingestion of an herbal remedy. The patient's renal function recovered slowly, and dialysis was discontinued after several weeks, although serum creatinine did not return to the normal range. Mass spectrometric and chromatographic analysis of the herbal remedy used by the patient revealed the presence of Cape aloes.[35]

Another case of renal impairment (toxic-interstitial nephritis and nutritive-toxic tubular injury) has been reported in a 45-year-old patient who regularly takes levothyroxine, developed glycosuria, albuminuria, hematuria, and leukocyturia after taking the aloe extract.[36] Also, another side effect of aloe plants can be bleeding. A case of massive intraoperative bleeding after oral consumption of *Aloe vera* tablets in an old woman aged 35 years possible is described because of the interaction between *Aloe vera* and sevoflurane. The compounds contained in *Aloe vera* can cause a reduction in prostaglandin synthesis, which may inhibit the secondary aggregation of platelets. Sevoflurane inhibits thromboxane A2 formation by suppression of cyclooxygenase activity, odd platelet aggregation, and prolongs bleeding.[37]

4.1. Limitations

The first limitation of the study is the number of subjects. Most obese subjects also have other associated diseases, especially cardiovascular, hepatic, digestive, or renal. Also, some treatments administered may interfere with the components of *Aloe ferox* causing side effects. Another limitation of the study is the period of administration. It cannot be administered for long periods due to the possible toxic effect, requiring first experimental studies on animals and then on human subjects.

5. Conclusions

The administration of *Aloe ferox* to obese patients has been shown to achieve a significant reduction in body weight, BMI, CT, LDLc, and fasting blood glucose. These effects may be due to the laxative and detoxifying action of *Aloe ferox* components. As it can only be administered for limited periods due to the side effects, further experimental and human studies of the efficacy of this plant for the treatment of obesity are needed.

Author contributions

A.G., and M.N. conceived and designed the study; M.F. performed the data analysis and interpretation; A.G., and M. N. writing – original draft; M.F., and M.N. writing – review & editing. R.T – supervision. The authors read and approved the final manuscript.

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