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Comparison of the use of herbal and medicinal plants with surgery, drugs and exercise as methods of weight loss in Ha'il region in Kingdom of Saudi Arabia

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ABSTRACT

Background: Obesity is a common and morbid disease. There are different methods to reduce weight. The most common surgical methods to reduce weight are bariatric surgical procedures which include gastric bypass, adjustable gastric banding and sleeve gastrectomy. Many drugs have been developed for the long-term management of obesity to cause a positive energy balance. Some herbal medicine products are taken as liquids or tea prior to eating, such as chamomile, green tea can assist in reducing weight. Others spices such as ginger help in weight loss. Many researches suggest that exercise is more effective in the prevention of overweight and obesity than its reversal. The aim of this study is to compare the use of surgery, drugs, exercise, and focusing on herbal remedies regarding weight reduction and to help in raising awareness among people to maintain healthy lifestyle. **Method:** A Cross-sectional study has been done among people in Ha'il, KSA. The data are collected by distributing online questionnaire. Statistical analysis has been done with (SPSS) V 23.0 (Chi-Square Tests considering level of significance $P \leq 0.001$ and $P \leq 0.05$). **Result:** The result of this study showed that a total 552 of participants in Hail, 29 (6.4%) female and 2 (2.2%) male had used herbs to reduce their weight and the most common used herbs were green tea, lemon, ginger and cinnamon respectively. 21 participants (4.6%) of female and 5 (5.6%) of male prefer surgery for weight loss. The 166 (36.4%) of female, while the male 36 (40.4%) make use of exercise to reduce the weight. Also, 3 (0.7%) of female used the drug, while male never used. **Conclusion:** The study concluded that the most common method used was exercise. The others were herbs, surgery and drugs, respectively.

Keywords: Herbs, Surgery, Drugs, Exercise, Method, Weight



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1. INTRODUCTION

Obesity is a complex disease and its prevalence has become all over the world among adults and children and adolescents (Engin, 2017). There are different methods to reduce weight, treatment of overweight and obesity). Surgery shows huge weight loss and decreases more than 40 obesity-related diseases or conditions, including type 2 diabetes, heart disease, obstructive sleep apnea, and certain cancers (Kokkinos, 2013). Gastric bypass, gastric banding, and Sleeve-gastrectomy are the most frequent bariatric operations. These procedures aim to restrict food intake and nutrient malabsorption, by decreasing hunger, increasing satiation during meals (Miras and Le Roux, 2013). Many drugs have been developed for the long-term management of obesity, with different mechanisms targeting different factors and different pathways that might cause a positive energy balance (Bhat and Sharma, 2017).

Drugs approved for long-term obesity treatment, when used as an addition to lifestyle intervention, lead to greater mean weight loss and an improved likelihood of reaching clinically significant 1-year weight loss relative to placebo. The fraction of patients attaining clinically significant (at least 5%) weight loss ranges from 37% to 47% for lorcaserin, 35% to 73% for orlistat, and 67% to 70% for top-dose phentermine plus topiramate–extended release (Susan and Jack, 2014). Any drugs used for weight loss should be safe for use in the long term (Halpern B and Halpern A, 2015).

Herbal medicine refers to herbal drugs, herbal preparations and completed herbal products which are used to prevent and treat diseases (Zöllner and Schwarz, 2013). Many herbal products, such as gentian, dandelion root, or chamomile, can stimulate gastric secretions and encourage fat and cholesterol breakdown when consumed as liquids or teas prior to feeding. Green tea is a diuretic, antioxidant, and metabolic enhancer, as well as a moderate appetite suppressant. Other herbs used as spices, supplements and foods to help in weight loss such as (ginger, cayenne, and fennel) augment digestion, stimulate salivation and gastric secretions and are antispasmodic by Nahin et al., (2009). Therapeutic exercises are therapeutic approaches with proven efficacy (Lambova, 2018). Many research suggested that exercise is more effective in preventing overweight and obesity than it is in its reversal. In addition to that, high-intensity interval walking programs can improve peak aerobic capacity and improve cardiovascular risk factors in middle-aged sitting individuals (Lalande et al., 2010). In a study done by Bohdjalian et al., (2010), people preferred sleeve gastrectomy (SG), thinking of it as a bariatric procedure as it is the only sole and final operation in morbidly obese patients. Three studies found that gastric bypass (GB) achieved greater weight loss up to five years after surgery than the adjustable gastric band (AGB). Further, two studies found that biliopancreatic diversion with duodenal switch achieved greater weight loss than GB after two years, but one death occurred in this study (Colquitt et al., 2014).

With regard to exercise, De Feo, (2013) reported that there are arguments for and against prescribing high-intensity aerobic activity to obese persons. The demonstration that high-intensity exercise tends to cause superior increases in aerobic activity in many trials is one of the pro arguments among the contra arguments to prescribe high-intensity exercise is the demonstration that prescribing a higher-intensity exercise decreases adherence and results in less exercise completion. Since obese subjects with low self-efficacy, weak mood status, and little experience with high-intensity exercises are likely to drop out, an effective fitness regimen should be proposed at a moderate intensity and low perceived commitment. Therefore, the study was planned to measure the widespread use of surgery, drugs, exercise, and focusing on herbal remedies regarding weight reduction in Ha'il, Saudi Arabia.

2. MATERIALS & METHOD

A cross-sectional study was conducted from November 2020 to April 2021; on people who used herbal and medicinal plants with surgery, drugs and exercise as methods of weight loss in Hail region in Kingdom of Saudi Arabia. Our target population was those who used these methods for weight loss age ≥ 18 years old. An electronic questionnaire was designed that consisted of 30 questions, included close-open-ended questions, which guided by study objectives and distributed electronically as the methods of collecting data. A total of 547 participants answered the questionnaire; however, five were excluded because they did not meet the inclusion criteria.

Statistical Analysis

All data were collected; analyzed using (SPSS) V 23.0. The observations for each question are tabulated. Statistical comparison was performed using SPSS 23 software (Chi-Square Tests considering the level of significance $P \leq 0.001$ and $P \leq 0.05$) to interpret results.

3. RESULTS

Demographic characteristics of the study population

A total of 547 surveys had successfully completed the study; however, five responses were excluded because they did not meet the inclusion criteria. The majority of respondents were female, with 83 % and 16.1% were male. In our study, most of the respondents

(62.2%) were between 18 - 30 years of age and single. Other demographic characteristics of the surveyed participants are shown in table 1.

Table 1 Demographic characteristics of participants (N=547).

Valid	Frequency	Percentage
1. what is your Age		
18 – 30	349	63.2
31 – 40	91	16.5
41 – 50	74	13.4
51 – 65	32	5.7
65 and more	1	0.2
Missing 5		0.9
2. Gender		
Male	89	16.1
Female	458	83
Missing	5	0.9
3. Marital status		
Single	283	51.3
Married	238	43.1
Divorced	18	3.3
Widower	7	1.3
Missing	6	1.1
4. Educational level		
Uneducated	1	0.2
Preschool	12	2.2
Secondary school	119	21.6
University graduated	415	75.2
Missing	5	0.9
5. Do you consider yourself as		
Underweight	62	11.3
Natural weight	242	44.2
Overweight	195	35.6
Obese	48	8.8
6. Methods to lose weight		
Surgery	32	5.8
Drugs	7	1.3
Herb	38	6.9
Exercise	470	85.1
Missing	5	0.9
7. How many meals don you eat daily		
1-2	292	52.9
3-4	244	44.2
5-6	11	2
Missing	5	0.9
8. Fast food/week		
0	125	22.85
1-2	297	54.29
3-5	103	18.83
6 and more	20	3.66
Missing	2	0.36

9. Exercise regularly		
Yes	139	25.5
No	408	73.9
Missing 5	5	0.9

Relationship of demographic characteristics with bodyweight

The relationships of demographic characteristics with bodyweight are shown in table 2. The highest percentage of the obese population was among 31 to 50 years of age. Among males, 12.4% and among females, 8.1 % were found to be obese. Married participants and people who were university graduates had the highest percentage of obesity as compared to single and less educated people, respectively. There was significant association of age, marital status and education with body weight.

Table 2 Demographic characteristics of participants and their association with body weight (N=547).

Variable		Underweight	Natural weight	Overweight	Obese	P value	
what is your age?	18 – 30	57 16.3%	185 53.0%	86 24.6%	21 6.0%	0.000	
	31 – 40	4 4.4%	35 38.5%	37 40.7%	15 16.5%		
	41 – 50	0 0.0%	19 25.7%	43 58.1%	12 16.2%		
	51 – 65	1 3.1%	3 9.4%	28 87.5%	0 0.0%		
	65 and more	0 0.0%	0 0.0%	1 100.0%	0 0.0%		
		Gender?	Male	7 7.9%	42 47.2%		29 32.6%
Female	55 12.0%	200 43.7%	166 36.2%	37 8.1%			
Marital Status?	Single	51 18.0%	142 50.2%	72 25.4%	18 6.4%	0.000	
	Married	9 3.8%	90 37.8%	109 45.8%	30 12.6%		
	Divorced	2 11.1%	8 44.4%	8 44.4%	0 0.0%		
	Widower	0 0.0%	1 14.3%	6 85.7%	0 0.0%		
		Educational level:	0 0.0%	0 0.0%	1 100.0%		0 0.0%
	Preschool	2 16.7%	7 58.3%	2 16.7%	1 8.3%		
Secondary school	24 20.2%	56 47.1%	30 25.2%	9 7.6%			
University graduated	36 8.7%	179 43.1%	162 39.0%	38 9.2%			

(Chi-Square Tests considering level of significance $P \leq 0.001$ and $P \leq 0.05$)

Methods of weight loss used by Overweight and Obese participants

Our analysis showed that almost all age groups preferred exercise as the most common method of weight loss. The male gender also chooses exercise as the most common method of weight loss (40.4%), while a high percentage (37.9%) of females did not use any method for weight reduction. For marital status, widowers used herbs as the most common weight-loss method, while married and single people used exercise as the most frequent tool for losing weight.

A high percentage of secondary school (46.2%) and university graduates (35.1%) did not use any weight-loss method, while exercise was the most commonly used method among both groups. A strong level of significance (P=0.000) was shown between choosing the method of losing weight (herbs, surgery, drugs, exercise) and age. Also, high significance (P= 0.000) had appeared with marital status. Educational level, moreover, had shown high level of significance (P= 0.011) with choosing methods to lose weight. However, there was no association level had seen between gender and the method used to lose weight.

Association of the method of losing weight with certain variables

The association of relevance of the method of losing weight was shown with certain relevant variables in table 3, by applying Chi-Square Test as a test of significance and keeping significance at (P=0.05). It was shown that the method of losing weight had a strong significant association (P=0.000) with age and gender. Education level also showed significant association (P=0.011).

Table 3 Methods of weight loss used by overweight and obese participants (N=545).

Variable		Herbs	Drugs	Surgery	Exercise	More than one method	Not used	P-value
Age	18 – 30	13	2	8	134	32	158	0.000
		3.7%	0.6%	2.3%	38.6%	9.2%	45.5%	
	31 – 40	10	0	9	37	13	22	
		11.0%	0.0%	9.9%	40.7%	14.3%	24.2%	
	41 – 50	2	1	9	17	27	18	
		2.7%	1.4%	12.2%	23.0%	36.5%	24.3%	
	51 – 65	6	0	0	14	5	7	
		18.8%	0.0%	0.0%	43.8%	15.6%	21.9%	
	65 and more	0	0	0	0	0	1	
		0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Gender	Male	2	0	5	36	13	33	0.651
		2.2%	0.0%	5.6%	40.4%	14.6%	37.1%	
	Female	29	3	21	166	64	173	
		6.4%	0.7%	4.6%	36.4%	14.0%	37.9%	
Marital Status	Single	11	2	4	114	24	128	0.000
		3.9%	0.7%	1.4%	40.3%	8.5%	45.2%	
	Married	13	0	19	86	50	69	
		5.5%	0.0%	8.0%	36.3%	21.1%	29.1%	
	Divorced	4	0	3	2	2	7	
		22.2%	0.0%	16.7%	11.1%	11.1%	38.9%	
	Widower	3	1	0	0	1	2	
		42.9%	14.3%	0.0%	0.0%	14.3%	28.6%	
Educational level	Uneducated	0	0	0	0	0	1	0.001
		0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
	Preschool	0	1	3	2	1	5	
		0.0%	8.3%	25.0%	16.7%	8.3%	41.7%	
	Secondary school	2	0	2	46	14	55	
		1.7%	0.0%	1.7%	38.7%	11.8%	46.2%	

	University graduated	29	2	21	154	62	145	
		7.0%	0.5%	5.1%	37.3%	15.0%	35.1%	

(Chi-Square Tests considering level of significance $P \leq 0.001$ and $P \leq 0.05$)

How many fast-food meals do you eat per week?

For the study participants who had been asked certain questions related to their weekly eating, results indicated that nothing was taken (125), 1-2 meals (297), 3-5 meals (103), 6 and more (20). In cross tabulation with the method they have been used to lose weight and strong significance ($P=0.000$), it was shown between weekly fast-food consuming and losing weight among overweight and obese participants.

Do you exercise regularly?

A significant relationship was seen ($P = 0.02$) between exercising regularly and methods used to lose weight. The majority of respondents (83%) preferred exercise as a method of losing weight. Regular exercising was chosen by (57%) of respondents. In addition, most of the respondents who used drugs, surgery and exercise for weight loss were not exercising regularly (3, 21, 137 participants), respectively. A strong level of significance ($P=0.000$) was shown between choosing the method of losing weight (surgery, drugs, exercise) and herbs. Also, high significance ($P= 0.019$) had appeared with exercising regularly. There was no association level had seen between the number of fast-food per week and the method used to lose weight. There is no significance between methods of losing weight and medical history, especially surgery ($P=0.640$). In addition, no significance had been found between the method of losing weight and marital status ($P= 0.459$), as shown in table 3. On the other hand, regarding weight status, no significant relation had found between weight and gender ($P= 0.332$), as shown in table 2.

Out of total 547 study participants in this study in comparison of herbs and other methods, we found that only 5.69% used it, 202 (37%) had been used exercise as a method to lose weight. However, a close number (206) of the respondent had not used any one of the mentioned methods. The completely respondent preference is shown in figure 1.

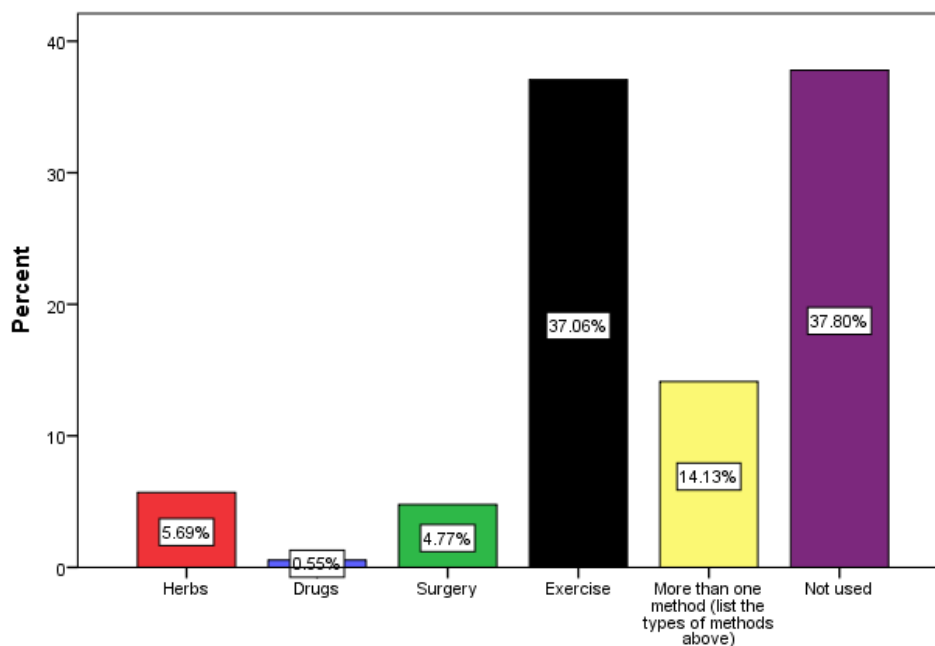


Figure 1 Methods of weight loss used by Overweight and Obese participants

Have you used herbs to lose weight?

The result of study participants for using herbs to lose weight showed that most of them used green tea (36.5%), followed by lemon (29.5%), and (25.4%) ginger in comparison with others, as shown in figure 2.

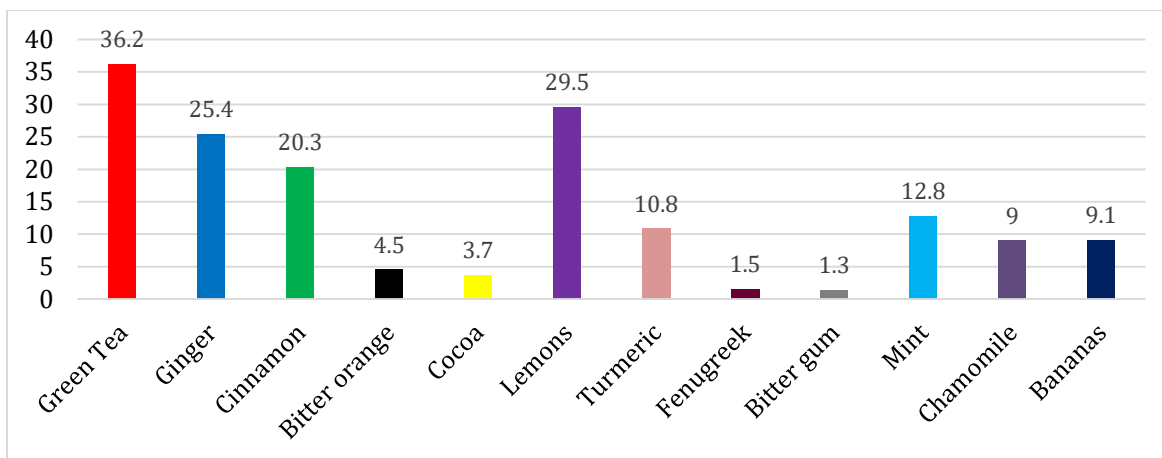


Figure 2 Percentage of people using different herbs for weight loss

4. DISCUSSION

The most important finding in this study was the common use of the above-mentioned herbal and medicinal plants in Hail region, and the most widely used was green tea. Two hundred study participants from a total of 552 were used green tea to reduce their weight (36.2%), and this finding was in consistent with a number of studies carried out with subjects that differ in terms of ethnicity and habitual caffeine intake. Hence, confirmed the impact of green tea on weight loss (WL) and weight maintenance (WM). The outcomes obtained from the meta-analysis demonstrated that an EGCC-caffeine mixture affects WL and WM long after the negative balance of energy. Moreover, the interchange of ethnicity and habitual caffeine intake was shown a facilitator (Pawar, 2015; Hursel, 2009).

Regarding the use of lemons in our study, it was concluded that 29.5% reduced weight in study participants and this was a similar finding with Negar et al., (2016), who found that group 1 had a substantial reduction in overall cholesterol ($P = 0.001$), low-density lipoprotein-cholesterol ($P = 0.001$), and fibrinogen ($P = 0.001$), as compared to the other classes. Group 1, with respect to groups 3 and 4 (37 ± 10 , $P = 0.01$) (24 ± 1 , $P = 0.02$), a larger decrease in the systolic and diastolic blood pressure was observed respectively; Additionally, the combined group has a significant decrease in body mass index as compared to the lemon juice and control groups ($P = 0.04$). Moreover, Bazzano et al., (2008) and Odegard et al., (2010) reported that lemon juice was an efficient way to lose weight by increasing the metabolism of the body. For those trying to lose weight with lemon, drinking lemon juice with warm water on an empty stomach every morning can produce excellent results. In addition to that lemon, when used every morning, had achievements as antibacterial, antiviral properties and its immune-boosting abilities. It had tremendous health benefits.

For ginger, result in our study indicated that (25.4%) of participants commonly used it to reduce weight. This finding was in harmony with Macit et al., (2020) in their review of studies assessing the impact of ginger on energy metabolism and obesity, the literature indicates that, by decreased carbohydrates and lipid oxidation, enhanced nerve function, improvements in hormone (leptin, insulin) and enzyme levels ginger may have significant effects on energy metabolism and overweight in animal models (amylase, lipase). Few human trials had also seen promising outcomes, but the results are contradictory due to inconsistencies in active ingredients, low doses, and brief administration times (single dose, 24 hours). A meta-analysis of studies found that ginger lowers BMI (95 percent CI: 1.33 4.02 to 1.84, $P = .003$), and researchers concluded that the connection between ginger and energy metabolism and obesity could be beneficial. However, the active component, as well as the optimum time and dosage, as well as the potential side effects of long-term use, must be assessed before a specific decision can be made.

Other plants in our study were cinnamon which reduced the weight by (20.3%). This was the same result of Mangala et al., (2017), who revealed that the use of cinnamon tea with 5 g/day with honey for 2 weeks might result in reducing the weight significantly at the level of ($P < 0.05$). Furthermore, a study by Vafa et al., (2012) concluded that consuming 2g of cinnamon a day lowers fasting serum glucose, triglyceride, blood pressure, and total cholesterol in people with type 2 diabetes, implying that using cinnamon in the diet of people with type 2 diabetes would lower risk factors associated with diabetes and cardiovascular diseases. Another research showed that vegetable oils are a powerful anti-diabetes and play an essential role in the management of the type 2 diabetes mellitus rat model, for example, hyperglycemia, dyslipidemia and renal injury by Parveen et al., (2019).

Moreover Khaled et al., (2020) found that out of 30 samples in the pretest, 70% of them had overweight and 30% of them had Class I obesity with the body mass index mean value of 28.75 and 2.72 standard deviation. In post-test, 20% of them were normal

weight, 66.67% were overweight, and 13.33% were Class I obesity. The post-test body mass index mean was 27.45 with 3.34 standard deviation. Paired t-test revealed that cinnamon tea was found to be effective in reducing weight at the level of $P < 0.05$. Regarding mint result, it was found that (12.8%) of participants used this to reduce weight. This was in agreement of the study of Kon (2020), who reported that mint leaves help with weight loss, low in calories and do not contribute to weight gain when consumed. It also indicated that eating pepper mint leaves can improve digestion due to the presence of menthol compounds in peppermint leaves. This enhances digestion and aids in weight loss because a weak digestive system can limit weight loss. Other plants used in our study for reducing weight were turmeric, bitter orange, coca, fenugreek and bitter gum. These plants were used in weight reduction with the percentage of (10.8%), (4.5%), (3.7%), (1.5 %), (1.3%), respectively.

The result of surgery as a method to reduce weight, in our study, we found that the most common type was sleeve gastrectomy. 19 participants of 552 undergo this type of method, (2) gastric bypass and (2) gastric balloon. This similar finding with the study of Peterli et al., (2018), who found that 217 adults with morbid obesity, some of them undergoing sleeve gastrectomy and others gastric bypass, the compare between them was 61.1% vs 68.3% after 5 years. That study did not find a significant difference between sleeve gastrectomy and gastric bypass to reduce weight. In addition to another study by Stanford et al., (2017) included 319 patients (Gastric bypass = 258; sleeve gastrectomy = 61) undergoes analysis which shows that more than half (54%; $n = 172$) of all study patients lost $\geq 5\%$ of their total weight with medications after surgery. One of these medications is to piramate and was the only one responsible for weight loss by 10%. While patients who undergo gastric bypass are more likely to lose $\geq 5\%$ of their weight with weight loss medications. In a recent study, sleeve gastrectomy (SG) has popular thinking as bariatric procedure and it the only sole and final operation in morbidly obese patients by Bohdjalian et al., (2010).

Regarding exercise as a method to lose weight in our study, the result indicated that 202 respondents had been used it. This same as the finding of Stoner et al., (2016) suggested that exercise intervention in overweight and obese adolescents improves body composition, particularly by lowering body fat and reduce weight. Many researchers suggest that exercise is more effective in the prevention of overweight and obesity than it is in its reversal. In addition to this finding, Lalande, et al., (2010) reported that high-intensity interval walking programs could improve peak aerobic capacity and improve cardiovascular risk factors in middle-aged sitting individuals.

Drugs as a method to lose weight had been used by only (3) participants, although drug therapy can assist in weight loss and its maintenance in individuals who do not achieve appropriate weight loss through lifestyle interventions alone. This is an agreement of (Aronne, 2002), who reported that weight loss drugs would likely succeed when being used, but the weight loss will actually not be sufficient if there is no attempt to retain the new weight. This was also in agreement of (Susan and Jack, 2014) concluded that drugs approved for long-term obesity treatment, when used as an addition to lifestyle intervention, lead to greater mean weight loss and an improved likelihood of reaching clinically significant 1-year weight loss relative to placebo, and of study of (Halpern B and Halpern A, 2015) reported that any drugs used for weight loss should be safe for use in the long term.

5. CONCLUSION

The study had shown a total 552 of participants in Hail. 29 (6.4%) of females and 2 (2.2%) of males had used herbs to reduce their weight. Total 21 participants (4.6%) of females and 5 (5.6%) of males they used surgery for weight loss. The 166 (36.4%) of females, while the males 36 (40.4%) they used to exercise. Also, 3 (0.7%) of females used the drug, while male never used. The most common used method in our study was exercise.

Informed consent

Informed consent was obtained from all participants included in the study.

Ethical Consideration

The study attained the ethical approval from the Research Ethics Committee at the College of Medicine, University of Hail (letter number Nr. 25518/5/42- project number H-2020-263).

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Author Contributions

All the authors contributed evenly with regards to data collecting, analysis, drafting and proofreading the final draft.

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Conflict of Interest

There are no conflicts of interest.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

- Aronne LJ. Obesity as a disease: etiology, treatment, and management considerations for the obese patient. *Obes Res* 2002; 10 (2): 95-96.
- Bazzano LA, Li TY, Joshipura KJ, Hu FB. Intake of fruit, vegetables, and fruit juices and risk of diabetes in women. *Diabetes Care* 2008; 31(7):1311-1317.
- Bhat SP, Sharma A. Current Drug Targets in Obesity Pharmacotherapy - A Review. *Curr Drug Targets* 2017; 18(8): 983-993.
- Bohdjalian A, Langer FB, Shakeri-Leidenmühler S, Gfrerer L, Ludvik B, Zacherl J, Prager G. Sleeve gastrectomy as sole and definitive bariatric procedure: 5-year results for weight loss and ghrelin. *Obes Surg* 2010; 20(5): 535-540.
- Colquitt JL, Pickett K, Loveman E, Frampton GK. Surgery for weight loss in adults. *Cochrane Database Syst Rev* 2014(8): CD003641.
- De Feo P. Is high-intensity exercise better than moderate-intensity exercise for weight loss. *Nutr Metab Cardiovasc Dis* 2013; 23(11): 1037-1042.
- Engin A. The Definition and Prevalence of Obesity and Metabolic Syndrome. *Adv Exp Med Biol* 2017; 960: 1-17.
- Gutierrez Hervas AI, Hervás, García-Galbis MR, Rizo Baeza MM, Castell EC, Villar NM, Aguilar Cordero MJ. Measurement units used in treatments to reduce weight and obesity. Systematic review. *Nutr Hosp* 2014; 30(3): 478-485.
- Halpern B, Halpern A. Why are anti-obesity drugs stigmatized. *Expert Opin Drug Saf* 2015; 14(2): 185-189.
- Hursel R, Viechtbauer W, Westerterp-Plantenga MS. The effects of green tea on weight loss and weight maintenance: a meta-analysis. *Int J Obes (Lond)* 2009; 33(9): 956-961.
- Khaled M Assag, Ahmed A, Alkahtany, Abdulfatah MN, Alhomaity, Ammar M Aldoais. A Comparative study between Male and Female with Type 2 Diabetic based on the effect of cinnamon supplementation on fasting serum glucose, triglyceride, total cholesterol levels, and blood pressure. *Al-Baydha University J (BUJ)* 2020; 2(3): 112-122.
- Kokkinos A, Alexiadou K, Liaskos C, Argyrakopoulou G, Balla L, Tentolouris N, Moyssakis L, Katsilambros N, Vafiadis I, Alexandrou A, Diamantis T. Improvement in cardiovascular indices after Roux-en-Y gastric bypass or sleeve gastrectomy for morbid obesity. *Obes surg* 2013; 23(1): 31-38.
- Kon A. Ways to Use Mint (Pudina) Leaves for Weight Loss. 2020.
- Lalande S, Okazaki K, Yamazaki T, Nose H, Joyner MJ, Johnson BD. Effects of interval walking on physical fitness in middle-aged individuals. *J Prim Care Community Health* 2010; 1(2): 104-110.
- Lambova S. Exercise Programmes for Osteoarthritis with Different Localization. *Curr Rheumatol Rev* 2018; 14(2): 123-130.
- Macit MS, Sozlu S, Kocaadam B, Acar-Tek N. Evaluation of Ginger (*Zingiber Officinale* Roscoe) on Energy Metabolism and Obesity: Systematic Review and Meta-Analysis. *Food Rev Int* 2019; 35(7): 685-706.
- Mangala Gowri P, MMT, Thenmozhi P, Meena P, Vimala S. Effectiveness of cinnamon tea in reducing weight among late obese Adolescence. *Asian J Pharm Clin Res* 2017; 10(4):156-159
- Miras AD, le Roux CW. Mechanisms underlying weight loss after bariatric surgery. *Nat Rev Gastroenterol Hepatol* 2013;10(10): 575-584.
- Nahin RL, Barnes PM, Stussman BJ, Bloom B. Costs of complementary and alternative medicine (CAM) and frequency of visits to CAM practitioners: United States, 2007. *Natl Health Stat Report* 2009; (18): 1-14.
- Negar Aslani, Mohammad Hasan Entezari, Gholamreza Askari1, Zahra Maghsoudi1, Mohammad Reza Maracy. Effect of Garlic and Lemon Juice Mixture on Lipid Profile and Some Cardiovascular Risk Factors in People 30-60 Years Old with Moderate Hyperlipidaemia: A Randomized Clinical Trial. *Int J Prev Med* 2016; 7: 95.

21. Odegard AO, Koh WP, Yu MC, Pereira MA. Soft drink and juice consumption and risk of physician – diagnosed incident type 2 diabetes: the Singapore Chinese Health study. *Am J Epidemiology* 2010; 171:701-708.
22. Parveen K, Siddiqui WA, Arif JM, Kuddus M, Shahid SMA, Kausar MA. Evaluation of vegetables and fish oils for the attenuation of diabetes complications. *Cellu Molec Biol (Noisy le Grand)* 2019; 65(7): 38-45.
23. Pawar P. Green Tea and Weight Loss: An update (Meta-Analysis). *IntJ Biotec Biomed Sciences* 2015;1(1): 21-24.
24. Peterli R, Karin B, Wölnerhanssen BK, Peters T, Vetter D, Kröll D, Borbély Y, Bernd Schultes B, Jürgen Drewe CB, Schiesser M, Nett P, Bueter M. Effect of Laparoscopic Sleeve Gastrectomy vs Laparoscopic Roux-en-Y Gastric Bypass on Weight Loss in Patients with Morbid Obesity: The SM-BOSS Randomized Clinical Trial. *JAMA* 2018; 319(3): 255-265.
25. Stanford FC, Alfaris N, Gomez G, Ricks ET, Shukla AP, Corey KE, Pratt JS, Pomp A, Rubino F, Aronne LJ. The utility of weight loss medications after bariatric surgery for weight regain or inadequate weight loss: a multi-center study. *Surg Obes Relat Dis.* 2017; 13(3):491-500.
26. Stoner L, Rowlands D, Morrison A, Credeur D, Hamlin M, Gaffney K, Lambrick D, Matheson A. Efficacy of exercise intervention for weight loss in overweight and obese adolescents: meta-analysis and implications. *Sports Med.* 2016; 46(11):1737-1751.
27. Vafa M, Mohammadi F, Shidfar F, Sormaghi MS, Heidari I, Golestan B, Amiri F. Effects of cinnamon consumption on glycemic status, lipid profile and body composition in type 2 diabetic patients. *Int J Prev Med*, 2012; 3(8): 531-536.
28. Zöllner T, Schwarz M. Herbal Reference Standards: applications, definitions and regulatory requirements. *Revista Brasileira de Farmacognosia* 2013; 23(1): 1-21.