



Diet biscuits rich in nutrients

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Abstract

The aim of the research was to produce biscuits with a high fiber content that would be well-received by consumers.

Manufacturing diet biscuits at a low price. The research questions were: Is it possible to produce a high-fiber biscuit that is well-received by society? Is it possible to produce diet biscuits at a low price with ingredients that are affordable to everyone? The research followed a descriptive, experimental approach by manufacturing biscuits that contain a high percentage of fiber at a low price, and an analytical approach by conducting an electronic questionnaire. The research concluded that diet biscuits fortified with dietary fiber were manufactured and obtained high rates in sensory evaluation in terms of general acceptance, taste, crunchiness, flavor, and color, where the rates were: 100%, 98%, 98%, 93%, and 88%, respectively. An electronic questionnaire was also conducted and it became clear that people who believe that technology increases the chances of obesity were 87.4% and those who do not believe that were 12.6%. It became clear that people who consider obesity a health concern were 97.1% and those who do not believe that were 2.9%. It became clear that people who agree that low physical activity leads to obesity were 98.3% and those who do not agree were 1.7%. It became clear that people who believe that eating fiber has a positive impact on body weight and getting rid of obesity were 93.1% and those who do not believe that were 6.9%. It became clear that 96% of people agree that obesity causes sleep disturbances and psychological disorders, while 4% disagree. It was found that 90.8% of people agree that it is possible to make diet biscuits rich in dietary fiber, while 9.2% disagreed. The study recommends increasing the amount of dietary fiber consumed in a healthy diet throughout the day and including chia seeds, flax, sesame seeds, oats, and almond flour in your diet due to their high nutritional value and healthy fiber that is beneficial for weight loss. It also recommends replacing regular sugar with honey to reduce calories, due to its high nutritional value and its role in weight loss.

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Introduction

The diet of Saudis is very rich in saturated fats, oils and sugars, and patterns of poor physical activity and total reliance on technology are believed to increase the chances of obesity. Figures published by the British medical journal «The Lancet» show that Saudi Arabia, in the ranking of the laziest countries, according to the magazine, the rate of physical inactivity in Saudi Arabia reached about 68%, and psychological conditions may increase the chances of obesity in Saudi Arabia, as 20% of Saudis suffer from depression, and suffer about 40% of sleep disorders, and these mental disorders lead to disorders in the diet, which may increase the likelihood of obesity. The professor of food and nutrition at King Saud University (Mohammed bin Saleh Al-Omari 2017) attributes the high rates of obesity in the Kingdom to «the changing conditions in the significant improvement of the standard of living among the population of the Kingdom, the change in the consumption dietary pattern, the diversity of sources and forms of food and methods of preparation and processing, and the high content of carbohydrates, sugars and fats, in addition to not exercising as required and relying on means Comfortable transportation, long periods of sitting and idleness.

Obesity is also a health concern in Saudi Arabia, where health reports state that obesity is one of the leading causes of death in Saudi Arabia. According to Forbes, Saudi Arabia ranks 29th as the fattest country in the world, with about 68.3% of Saudis overweight (BMI 25). Lauren, 2007 Streib and adding to the problem is that according to the presentation made at the Third International Conference on Obesity in February, 2014, that obesity-related surgeries are not covered under Saudi health care. (Khan Fouzia, 2014) In mid-2016, the Saudi Ministry of Health released statistics stating that 40% of Saudi males suffer from obesity, while about 62% of Saudi women suffer from it, thus Saudi Arabia ranks third in the world in the incidence of obesity among women, as shown by a study conducted by the Chair of Obesity Research at King Saud University. Three quarters of Saudi society are obese, 70% for men and 75% for women, and statistics show that more than 80% of type II diabetes cases in Saudi Arabia are related to obesity. According to the World Health Organization, Saudi Arabia is one of the ten countries in the world with the most obesity rates, as about 65% of adults in Saudi Arabia currently suffer from excess weight, and 28% suffer from obesity, and this leads to these people often suffering from diseases associated with excess weight, such as type II diabetes, and high blood pressure,

The aim of this research is to manufacture diet biscuits with easy and low-price ingredients and accessible to everyone and the target group is people with obesity.

Search problem:

- Is it possible to manufacture fiber-rich biscuits that are acceptable to society?

Is it possible to manufacture biscuits for a diet at a low price and affordable ingredients.?

Research Objectives:

- Manufacturing biscuits with a high fiber content and is accepted by consumers
- Manufacture of diet biscuits at a low price

The importance of research:

- The importance of the study is due to the manufacture of diet biscuits at a low price, a pleasant taste and high nutritional value.

Research hypotheses:

- Biscuits can be manufactured with high nutritional value and low price
- Seeds that contain fiber lead to the elimination of excess weight.

Research Methodology:

Descriptive depends on references from scientific research that serves the subject of the research, experimental is manufactured biscuits containing a high percentage of fiber at a low price, analysis by conducting an electronic questionnaire

Spatial boundaries:

Nutrition Laboratories, Department of Home Economics, King Khalid University, College of Science and Arts, Tihama

Time Limits: Second Semester 1444 AH

Theoretical part:

Obesity is defined by the World Health Organization (WHO) as the excessive accumulation of fat in the body, which can affect a person's health

(2021 Obesity and overweight")

It is worth noting that a person is considered obese if his weight rises above the normal range by a large amount, as for overweight, it is the increase in body weight from the normal range, but not in a very dangerous way as is the case with obesity. (2021 Obesity", health direct,)

Reasons for the spread of obesity:

Obesity mainly occurs as a result of eating a large amount of calories in excess of what the body burns during daily activities and exercise, although the body is affected by genetic factors and the surrounding environment, as well as hormones and levels of metabolism or metabolism within the body

(2021 Obesity)

The most important reasons for the spread of this phenomenon are the following:

- Eating large amounts of food:

- Lack of physical activity:

Poor dietary pattern characterized by high-calorie foods and high-fat meals;

- the presence of genetic causes related to the family history of individuals,

- Lazy, sedentary and lack of exercise,

- The presence of an organic defect in the body, such as: disorders in the secretions of the endocrine glands.

- Taking some drugs and medications, such as: contraceptive drugs for women, and medicines for the treatment of mental illness,

- Slow metabolic processes in the body due to various reasons. (Atka Ziad Al-Burweini 2017)

Obesity treatment:

Obesity is treated by getting rid of its causes, such as replacing unhealthy foods with fresh vegetables and fruits, foods rich in natural fibers, in addition to regular exercise, and treating the organic causes that led to an increase in body weight, under the supervision of a specialist doctor, and many surgeries and medical interventions can be performed to get rid of obesity, such as: making a gastric balloon, gastric banding and cutting operations, taking some medicines that increase fat burning in the body, and certain types of food can be eaten, such as: Pineapple, green tea, and cinnamon because they increase the burning processes in the body.

(Atka Ziad Al-Burweini 2017)

Obesity is one of the serious health disorders , which may cause the body many health disorders ,

Dietary fiber :

Dietary fiber is one of the edible parts of plants or their extracts, is indigestible or absorbable in the small intestine, and usually undergoes full or partial fermentation in the large intestine (Dietary Fibre", www.nrv.gov.au 2019

Dietary fiber has many physical and chemical properties, which are responsible for its functional behavior, such as solubility, fermentation, viscosity, and water absorption

Deepak Mudgil, (2017)

Recommended amounts of dietary fiber In general, experts advise increasing the amount of fiber intake as part of a healthy and balanced diet, and looking for ways to increase its intake, and the following are the recommended amounts for different age groups Children from two to 5 years old: They need the equivalent of 15 grams per day. Children from 5 to 11 years old: They need the equivalent of 20 grams per day. Children from 11 to 16 years old: They need the equivalent of 25 grams per day.

Chia seeds: They are the small black seeds of the chia plant (scientific name: *Salvia hispanica*), and its original homeland dates back to Mexico and Guatemala, and the word chia is an ancient word in the Mayan civilization (English: Maya), and means strength, and chia seeds were a staple food for the Aztec peoples (English: Aztecs)

Nutritional value of chia seeds:

Nutrients found in 100g of chia seeds

Nutritional value	Nutritional element
486 calories	Energy
5.8ml	Water
16.5g	Protein
30.7 grams	Total Fat
42.1g	Carbohydrates
34.4g	Fiber
631 milligrams	Calcium
7.72milligrams	Iron
335 milligrams	Magnesium
860 milligrams	Phosphorus
407 milligrams	Potassium
16mg	Sodium
4.58milligrams	Zinc
0.924milligram	Copper
2.72mg	Manganese
55.2mcg	Selenium
1.6mg	Vitamin C
0.62milligrams	Vitamin B1
0.17mg	Vitamin B2
8.83milligrams	Vitamin B3
49mcg	Folate
54IU	Vitamin A

Inas Malkawi (2021)

How to use chia seeds:

Chia seeds are easy to introduce to the diet, and can be added to any dish, as they do not affect the taste much, and they do not need to be ground like flax seeds, which makes their preparation easier, as they can be eaten raw, soaked in juice, or added to porridge (English: Porridge), pudding (English: Pudding),

cocktails, or added to baked goods, and a few of them can be sprinkled when eating breakfast cereals, yogurt, or vegetables, the Kris rice Gunnars, (2018).

Apples and their benefits for dieting:

Apples are considered a healthy food choice, because they are rich in fiber, vitamin C, and many important nutrients for the body, and the following are their most important health benefits:

- A good source of many nutrients such as fiber, vitamin C, polyphenols, manganese, copper, vitamin A, vitamin E, vitamin B2, vitamin B3, and vitamin B6.
- Helping to lose weight due to its low calories and contributes to a feeling of fullness.
- Reduce the risk of type II diabetes because it is rich in antioxidants.
- It nourishes the beneficial bacteria in the intestines due to its high fiber content.
- Help prevent cancer.
- .Help prevent the decline of neurotransmitters that have a role in memory

Ariane Lang, (2022)

Flaxseed:

Flaxseeds are one of the richest seeds in fiber, so eating them makes a person feel full for longer, and reduces his desire to eat, which reduces the amount of calories eaten, and this may help to lose the abdomen and reduce weight

(Watson Kathryn, 2019)

The benefits of flaxseed :

Flaxseed provides many health benefits to the body, the most important of which are the following:

- Breast Cancer Prevention:
- Diabetes prevention:
- Reducing inflammation: reducing menopausal symptoms: Lana Barhum (2019), Elaine Magee, (2019)

Honey:

Honey is a sweet liquid taste, and bees make it from the nectar of flowers, and there are approximately 320 different types of honey, which differ in color, smell, and flavor, and honey contains a mixture of amino acids, vitamins, minerals, and antioxidants, and has anti-inflammatory, bacterial, viruses, and germs, in addition to being used as an antiseptic

Miguel, Antunes, Faleiro (2017)

Honey benefits:

Honey is one of the healthy foods that provide many benefits to the body, and we mention its benefits as follows:

- Anti-inflammatory:
- Help boost the immune system:
- Contribute to maintaining the health of the digestive system:
- Helping to treat burns: Allison Tsai, (2013)
- :Help regulate cholesterol and lower triglyceride levels

Kris Gunnars (2018)

Benefits of almond flour:

- **Rich in nutrients:**
- **Maintain heart health:**
- **Control blood sugar levels :**
- **Maintaining Digestive Health :** Arefa Cassoobhoy MD, (2020),

Gluten Free:

How to prepare almond flour:

1. Almonds are placed in boiling water to be boiled.
2. Peel off the almonds.
3. Grind boiled and peeled almonds until smooth.
4. Sift the almonds after grinding them in order to remove any large pieces of them

Kim Rose RDN, (2021).

***Uses of almond flour:**

- Used in the manufacture of biscuits.
- It is used to make cakes and quick baking.
- It is especially used in French macarons, as it is an essential ingredient in the macaron recipe.
- Almond flour is used in recipes for those who follow weight-loss diets as an alternative to regular flour, because it contains low calories.
- Almond flour is widely used in keto diet recipes.

Biscuit:

It is a popular food item consumed by a wide range of residents due to its diverse taste, long shelf life and relatively low cost. Due to competition in the market and the increasing demand for healthy, natural and functional products, attempts are being made to improve the nutritional value and functionality of biscuits by modifying their nutritional composition, and these effects are often achieved by increasing the proportion of full raw materials. Substances other than wheat or different types of dietary fiber in basic recipes while trying to increase the content of biscuits of protein and minerals for quality and availability.

(Tyagi et al, 2006,) or increase the dietary fiber content and improve the biological properties of the final product (Gallagher, et al,)

Lubna Al-Masoudi, Dr. Vidhu Airy, 2012

Oatmeal biscuits:

The current study aimed to formulate and evaluate biscuits made from different levels of whole oatmeal (WOF) and roasted flaxseed flour (15, 20 and 25%). Biscuits made from wheat flour (and 15% 10, 5)WF) and various mixtures were evaluated in terms of physical and chemical, texture, color parameters and organoleptic properties. WOF and RFF were found to be rich in protein, fat, minerals and fiber compared to WFs.

(Hand Mahmoud Abozeid, et al, 2022)

The aim of this study was to formulate and evaluate biscuit types consisting of a mixture of oatmeal, wheat germ, flaxseed, pomegranate peel and wheat flour in different proportions to support the nutrition of patients. Methods: Using: Oatmeal, wheat germ, flaxseed, pomegranate peel and wheat flour and their mixtures to produce biscuits from a functional flour blend suitable for nutritional support for patients. The biscuits made from 100% wheat flour were prepared for a control sample. All chemical compositions have been studied, gelatinization Starch, diffraction scanning colorimetry DSC color qualities and organoleptic properties of biscuits. Oatmeal was added to wheat flour at the level of 10, 20, 30, 40 and 50%. Results: Farinograph coefficients showed increased water absorption with an increase in the proportion of oatmeal in wheat flour.

The diffraction of the color scan and Visco-amylograph parameters were significantly affected. The results also showed that the color coefficients of Hunter L*, a* & b for biscuits were darker with an increased level of mixing oatmeal, but the sample containing oatmeal, wheat germ, flaxseed and pomegranate peel had excellent nutritional values and (good) acceptable traits that made it suitable for patients to support their nutritional deficiencies due to treatments (chemotherapy and radiotherapy) with difficulty meeting their nutritional requirements. It can be concluded that: oatmeal + wheat germ + flax seeds + pomegranate peel Can be used with wheat flour to create a biscuit characterized by its good organoleptic characteristics And its high nutritional value in addition to its positive effect on rheological characteristics

Ahmed S Hussein, et al, 2022)

The effect of adding honey in the biscuit industry:

The goal of the current work was to develop a new filling composition by partial replacement of refined sugar and fat with honey. In order to obtain a high-quality cream, different formulations were evaluated. For the first time, the effects of each component were studied in detail by specific statistical tools and predictive models of texture properties were developed. Statistical analysis showed that honey significantly increased the antioxidant content in biscuit fillings (P 0.05)

How to conduct research

The experiment was conducted by manufacturing biscuits for diet containing almond flour, flax seeds, chia seeds, oats, butter and eggs, and the materials used in the manufacture of biscuits were purchased from the markets of Mahayil and we conducted the experiment in the nutrition laboratories in the Department of Home Economics at the College of Science and Arts in Mahayil Asir and was evaluated by faculty members, employees and students, and the number of residents was 30 people

Biscuits for diet

Ingredients:

1/2 cup ground oats

2 / 1/4 cup white honey

3/ 100 g butter

4/ 1/4 cup ground linen

5/ 1/4 cup chia

6/ 1/4 cup sesame seeds

7/1 and a half cup almond flour

8/ A teaspoon of king powder

9 / half warm water + 1/4 cup milk powder

10/ a pinch of salt

11 / one green apple grated

How to prepare biscuits

First, add the eggs in the mixer, then add the butter, honey and vanilla and stir well until the ingredients are mixed with each other, then add a quarter cup ground flax seeds and chia seeds, add sesame and stir well, then add the dry ingredients, almond flour, oats, milk powder, king powder, half a cup of water, stir well, then add the grated apples until the dough becomes cohesive and then form the dough After manufacturing, the biscuits were evaluated sensually by faculty members, administrators and students at the College of Science and Arts in Mahayil Asir. Through the attached table

Biscuit Sensory Assessment Test

Diet biscuits rich in dietary fiber

Sample	Color	Flavor	Vulnerability	Bait	General Admission
Diet biscuits					

Give grades as follows:

Excellent =4. Very good =3. Good=2. Acceptable =1

Conducting the questionnaire

An electronic questionnaire was conducted to find out the extent to which the community accepts diet biscuits with cheap ingredients and contains high nutritional value, and the questionnaire contained 39 questions, and the questionnaire was distributed through social networking sites in the community of college students and residents of the region, and the number of responses was 174

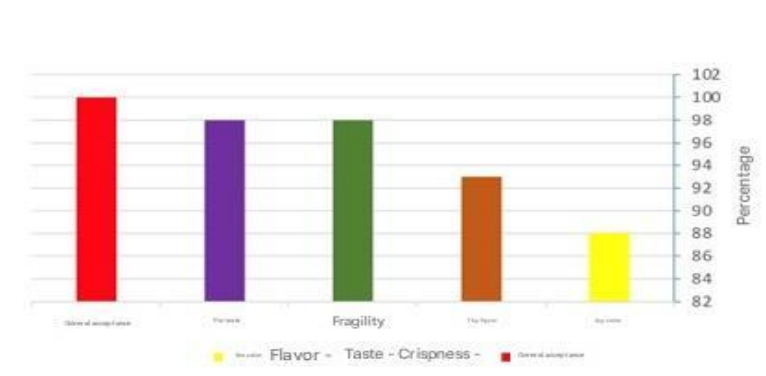
Online Questionnaire

<https://forms.gle/3TM4HXhpNjbrgxf79>

Results and discussion

A biscuit rich in fiber containing almond flour was manufactured instead of wheat flour, which contains gluten protein, which leads to a sense of hunger and eating more, and chia seeds, flax, oats, sesame and green apples were added, which studies have proven that all of them are rich in soluble and insoluble fiber and their nutritional value is high, then the biscuits were evaluated sensory because there were no laboratories to carry out the necessary analyzes for that and the results of the sensory evaluation were as follows.

Sensory assessment scheme for biscuits



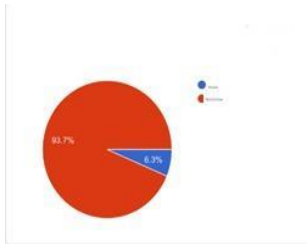
As shown in the graph above, the fiber-rich diet biscuits got the highest percentage in the sensory evaluation in terms of general acceptance 100%, due to the presence of almond flour with a taste that is loved by all, chia seeds, flax, sesame and green apples, and it got 98% in terms of crispness and taste, and it got 93% in terms of flavor and got 88% in terms of color. This product is characterized by containing ingredients high in nutritional value such as almond flour, flaxseed, chia seeds, sesame, apples, green,

Results and discussion of the questionnaire

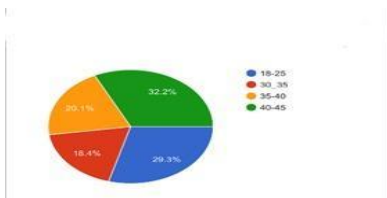
An electronic questionnaire was conducted on the possibility of manufacturing diet biscuits rich in fiber and the extent of society's knowledge of natural foods that help to lose weight, and the link was distributed on social media channels and the number of responses was (174) and the results of the analysis were as follows:

1. Gender

As shown in the figure above, 93.7% more interactive are females while males are less interactive by 6.3%, where the questionnaire was distributed to students and employees of the College of Science and Arts in Mahayel Asir



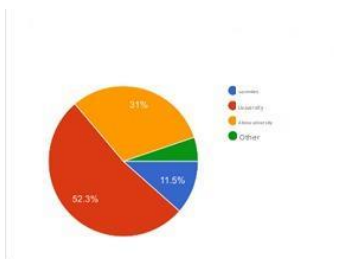
2. Age



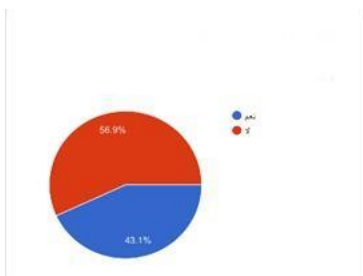
As shown in the figure above, the age group of 45-40 is the most interactive age group by 32.2%, the age group of 25-18 by 29.3%, the age group of 35-40 by 20.1 and the age group of 35-30 by 18.4%

3. Educational level

As shown in the figure above, the university stage is more interactive by 52.3%, the post-university stage constitutes 31%, the secondary stage constitutes 11.5%, and the other is a penny by 5.2%.



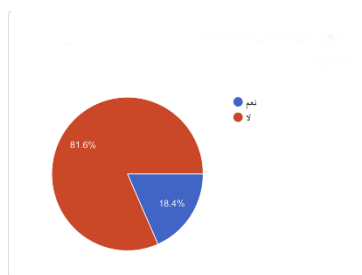
4_ Do you have a family member who is obese?



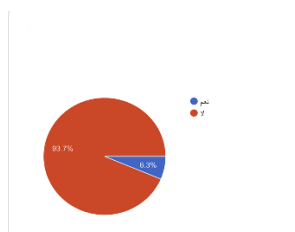
As shown in the figure above, 56.9% of respondents did not have individuals with obesity, while 43.1% had individuals with obesity, as the presence of genetic causes is related to the family history of individuals, as many families have the ability to store fat in their bodies more than others, and their burning rate is slow.

5-Are you obese?

As shown in the figure above, 81.6% are not obese while 18.4% are obese.



6-Have you ever used medications due to obesity?

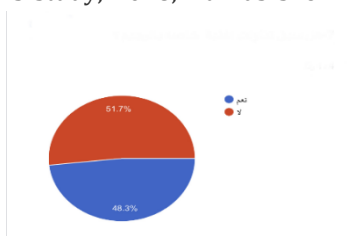


As shown in the figure above, 93.7% do not use drugs to lose weight, while 6.3% use weight-loss medications.

There are many solutions used in weight loss, such as weight loss pills, medications and supplements.

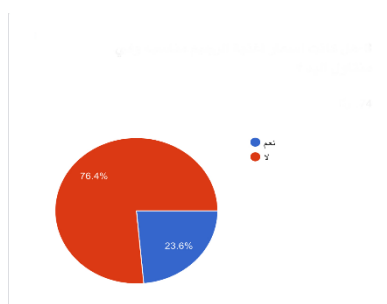
7-Have you ever eaten dieting foods?

As shown in the figure above, 51.7% have never eaten dieting foods, while 48.3% have previously eaten dieting foods in the Kris Gunnars study, 2018, it was shown that taking robotic supplements: (which



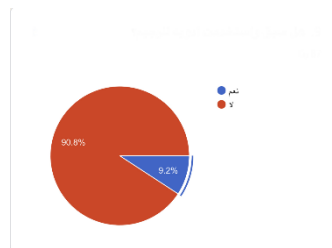
contain lactobacillus bacteria) contribute to the reduction of fat mass from the body.

8- Were the prices of diet foods appropriate and affordable?



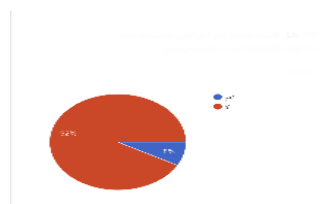
As shown in the figure above, 76.4% of dieting food prices were not suitable for them and their prices are expensive, while 23.6% are suitable for dieting food prices and are affordable.

9. Have you ever used diet medications?



As shown in the figure above, 90.8% did not use diet drugs, while 9.2% had previously used diet drugs.

10-Did you have any side effects when taking diet medications?



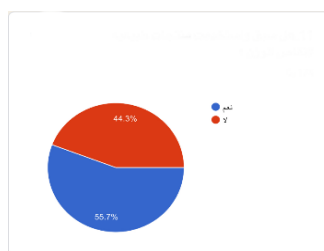
As shown in the figure above, 92% did not have any side effects when taking diet medications and 8% had side effects when taking diet medications.

.According to studies, the side effects of taking these pills almost outweigh their benefits

Amrita Surendranath's,2018

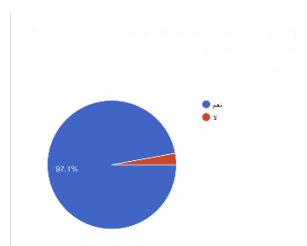
11_Have you ever used natural products to lose weight?

As shown in the figure above, 55.7% have previously used natural products to lose weight, while 44.3%



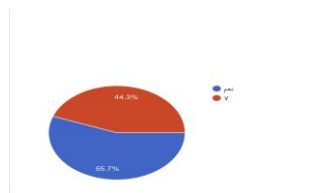
have never used natural products to lose weight, as many studies have proven that seeds can be used to prepare shea gel,

12- Did you know that one of the causes of obesity is the use of drugs and medicines?



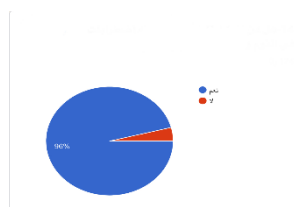
As it is. Shown in the figure above, we find that 55.7% know that drugs and drugs are among the causes of obesity.

13-Is obesity a health concern for many people?



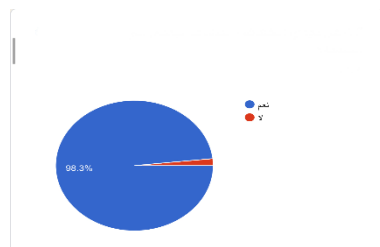
As shown in the figure above, 97.1% consider obesity to be a health concern. 2.9% do not consider obesity to be a health concern.

4. Is it possible that obesity causes sleep disorders and psychological disorders?



As shown in the figure above, 96% agree that obesity causes sleep disorders and psychological disorders, while 4% disagree.

15-Does low physical activity lead to obesity?



As shown in the figure above, 98.3% agree that a decrease in physical activity leads to obesity, while 1.7% disagree.

Conclusion and recommendations

The bottom line:

Diet biscuits were manufactured fortified with dietary fiber and obtained high percentages in the sensory evaluation in terms of general acceptance, taste, fragility, flavor and color, where the percentages were: 100%, 98%, 98%, 93%, 88% respectively and also an electronic questionnaire was conducted and it was found that people who believe that technology increases the chances of obesity 87.4% and who do not believe 12.6% It turned out that people who consider obesity a health concern 97.1% and those who do not believe 2.9% It turned out that people who agree that low physical activity Leads to obesity 98.3% and who do not agree 1.7% It turned out that people who believe that eating fiber reflects positively on body weight and get rid of obesity 93.1% and those who do not think that 6.9% It turned out that 96% of people agree that obesity causes sleep disorders and mental disorders while 4% do not agree on that and

it turned out that 90.8% of people agree that it is possible to manufacture biscuits for diet rich in dietary fiber while 9.2% do not agree on that .

Recommendations:

1. We recommend increasing the amount of dietary fiber intake in a healthy diet during the day
2. We recommend introducing chia seeds, flax, sesame, oats and almond flour into your diet because they contain high nutritional values and healthy fiber useful in weight loss.
3. We recommend replacing regular sugar with bee honey to reduce calories, its high nutritional value and its role in weight loss

Acknowledgments

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