

## Research Article

# Effects of Dietary Fiber Intake on Body Weight and Waist Circumference

Eiman Al Hammadi

Department of Natural Sciences and Public Health, Zayed University, Abudhabi, UAE

### Abstract

**Aim:** Obesity levels dramatically increased in the last decade in UAE. Diets high in energy, saturated fatty acids, low intake of fruits and vegetables as well as inactivity have been found to promote overweight and obesity. A diet high in fiber has been suggested to improve weight loss and decrease other anthropometrical indices. The purpose of this study was to assess the effect of a diet high in fiber on body weight, BMI, and waist circumference (WC).

**Methods:** One hundred forty overweight/obese subjects aged from 20-30 years old participated in the study. Body weight (BW), body mass index (BMI) and waist circumference (WC) was measured after one month period in which the subjects consumed diet high in dietary fiber (38 g/d/men, 25 g/d/women). SPSS was used for the analysis of data and statistically significant difference was set at  $P > 0.05$ .

**Results:** BW, BMI and WC were clinically reduced before and after intervention in both males and females. However, these changes were not statistically significant. Percent changes on BW for female and male subjects were 1.45 (95%CI: -12.68, 15.58),  $P > 0.05$  and 1.12 (95% CI: -13.58, 15.82),  $P > 0.05$ , respectively.

**Conclusion:** The high fiber diet did not significantly reduce body weight and WC. Even though there was a small clinically reduction on BW, BMI and WC, however this was not statistically significant. The results, even though were not supportive, they should not discourage people from consuming foods high in fiber, due to other beneficial effects in their health such as decreasing the risk of cancer, lipidemia, type 2 diabetes and metabolic syndrome.

Corresponding Author: Eiman Al Hammadi; email: eimanal-hammadi@hotmail.com

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## 1. Introduction

The problem of overweight and obesity have gone to high proportions globally, besides one of the reasons is adoption of a westernized lifestyle, intake of excessive food and inadequate physical activity are common characteristics of this life style [1]. References in the last two decades indicate that obesity has reached to double in USA, and now 30% of the US adult population is classified as obese, while the overweight people



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are reaching the 35%. Pediatric obesity is also an increasing problem with about 16% being overweight and an additional 15% are at risk of overweight [2].

In addition, increased levels of obesity and low physical activity has been noted during these decades, with shocking increases in prevalence of type 2 diabetes. The number of the total adults with diabetes type 2 is expected to be doubled between 2000 and 2030 [2].

The prevalence of obesity is high in industrialized societies. According to research report by CDC [3] "more than one-third of U.S. adults (34.9%) are obese while the annual medical cost of obesity in the U.S. is \$147 billion" [3].

A report published by the Gulf News (July, 2012) referring to BMC Public Health journal published in the health journal warned that the world's adult population is getting fatter rapidly. 17 million tones of total population weight are due to people being overweight [4].

UAE Ministry of Health had warned that more people are dying of non-communicable diseases such high blood pressure, diabetic and heart failure. The ministry alarmed that children are less physically active today which will make population obese by the year 2015. According to the ministry sources about 44.5 % of the women in the UAE could become obese in coming years if it goes on the same rate as today [5].

In UAE obesity is not only a problem in women and men but this is increasing in children also. One of the common reasons of obesity in children UAE is changing eating habits revealed in their research that the influx of the Western lifestyle [6]. This life style has resulted in changes in both behavioral patterns and food consumption habits. The traditional style of eating and foods such as milk, dates and porridge is being replaced by processed foods such as soda, high sugar, and high fat foods items [7].

Dietary fiber can be metabolized by the gut micro biota to promote the growth of beneficial bacteria in the gut. Increased consumption of dietary fiber and whole grains is helpful in normalizing the symbiosis of the gut micro biota and can improve gut micro biota interactions in obesity and other metabolic diseases. There are differing impacts on the gut micro biota because of the diverse compositions and structures of dietary fibers and whole grains [8], some of the dietary fibers may be more beneficial against obesity than others [9].

One of the beneficial effects of fiber is to promote satiety by decreasing food intake, and also inhibits fat deposition by removing them through bile production and stool. The recommended daily intake of fiber for healthy adults is between 20 and 35 g/d [10].

Dietary fiber intake is been found to help control KCal intake as well as to reduce the risk of weight gain leading to overweight and obesity. The role of dietary fiber in energy intake is directly connected to the development of overweight and obesity and

it's related to any chemical and physical properties that are connected to the satiety signal in the brain (Rolls, 1987).

The main purpose of the this study is to identify the relationship between fiber intake and obesity by examining the effects of a high fiber diet with other anthropometrical parameters such as BW, BMI and WC in 140 adults aged 20-30 years old.

## 2. Methodology

The study included 140 subjects (63 males and 77 females) randomly selected, aged 20-30 years old from the general population of Abu Dhabi. The study took place from Jan 2014 to May 2014. Participants with any acute or chronic disease were excluded from the study. Subjects signed a consent form and the study was approved by the ethical committee of Zayed University.

Height and weight measured by using the digital/calibrated physician scales to the nearest 0.1 cm and 100 gr, respectively. Waist circumference measured with a regulated tape to the nearest 0.1 cm. BMI was calculated by the standard formula:  $\text{weight(kg)}/\text{height(m)}^2$ . Participants were asked to consume their usual daily calorie intake and food meals and just add/or replace choices of food with high in dietary fiber (25 gr /day/women and 38gr /day/men) from a list that was given to them for a period of 1 month period. A brochure (appendix 1) was given to each person to explain the amount and types of foods high in fiber. Data were analyzed using Microsoft EXCEL program and SPSS program. Statistically significant difference was set at  $P < 0.05$ .

## 3. Results

Table 1 displays the main characteristics of the women subjects before and after fiber intervention. A clinical small reduction was noted for body weight BMI and WC. However these changes were not significantly important.

Similarly, Table 2 shows the changes for male subjects. The mean and SD for weight, BMI, and waist for men before and after changes their diet. The weight mean before was 98.64 and it decreased to 97.54 and SD was 14.13 and declined to 14.61. The waist mean reduced by 0.28 and SD decreased by 0.22 from (mean  $\pm$  SD)  $96.4 \pm 6.93$  to  $96.12 \pm 6.71$ .

The Z test was used for analysis of pre and post intervention data for both females and males. The independent sample z test was used for comparison the results between the intervention of before and after one month of high intake of Fiber in the same group of female and male.

Parameter		Minimum	Maximum	Mean	SD	Z Value	P value
<b>Age (year)</b>	Before	20	30	24.77	2.75	-	-
	After	20	30	24.77	2.75		
<b>Height</b>	Before	153	174	162.78	3.88	-	-
	After	153	174	162.78	3.88		
<b>Weight</b>	Before	65.5	126	88.27	14.13	0.5607	
	After	63.9	123.6	87	13.98		0.575
<b>BMI</b>	Before	25	47	33.35	5.5	0.5332	
	After	24	46	32.88	5.44		0.5939
<b>Waist</b>	Before	80	111	94.05	7.28	0.2335	
	After	80	110	93.78	7.07		0.81537

TABLE 1: Characteristics of female subjects (n = 77) before and after intervention.

Parameter		Minimum	Maximum	Mean	SD	Z Value	P value
<b>Age (year)</b>	Before	20	30	25.57	3.25	-	-
	After	20	30	25.57	3.25		
<b>Height</b>	Before	165	184	175.59	4.15	-	-
	After	165	184	175.59	4.15		
<b>Weight</b>	Before	79.2	143	98.64	14.7	0.4213	
	After	77.8	140	97.54	14.61		0.6735
<b>BMI</b>	Before	25	48	32.06	5.12	0.3966	
	After	25	47	31.7	5.07		0.6917
<b>Waist</b>	Before	85	119	96.4	6.93	0.2303	
	After	85	117	96.12	6.71		0.8179

TABLE 2: Characteristics of Male subjects (n = 63) before and after intervention.

		Mean	Mean difference%	95% CI (LL,UL)	SD
<b>Weight</b>	Before	88.27	1.45	(-12.68),15.58	14.13
	After	87		(-12.53),15.43	13.98
<b>BMI</b>	Before	33.35	1.42	(-4.08),7.81	5.5
	After	32.88		(-4.02),6.86	5.44
<b>Waist</b>	Before	94.05	0.29	(-6.99), 7.57	7.28
	After	93.78		(-6.78),7.36	7.07

TABLE 3: % Changes on Body Weight among Female.

		Mean	Mean difference%	95% CI (LL,UL)	SD
<b>Weight</b>	Before	98.64	1.12	(-13.58),15.82	14.7
	After	97.54		(-13.49),15.73	14.61
<b>BMI</b>	Before	32.04	1.07	(-4.05),6.19	5.12
	After	31.7		(-4.00),6.14	5.07
<b>Waist</b>	Before	96.4	0.29	(-6.64), 7.22	6.93
	After	96.12		(-6.42),7.00	6.71

TABLE 4: % Changes on Body Weight among **Male**.

A small reduction is observed in weight of females as shown in (Table 3) by 1.45% from (mean  $\pm$  SD)  $88.27 \pm 14.13$  to  $87.00 \pm 13.98$ , (95% CI: -12.68 to 15.98; where the value of P is > than 0.05 so the result is not significant. And, BMI also reduced as shown (Table 3) by 0.29% from (mean  $\pm$  SD)  $33.35 \pm 5.5$  to  $32.88 \pm 5.44$ .

A small drop was also observed for males in weight as shown in (Table 4) by 1.12% from (mean  $\pm$  SD)  $98.64 \pm 14.7$  to  $97.54 \pm 14.61$ , (95% CI: -13.58 to 15.82; where the value of P > 0.05 so the result is not significant), as well as for BMI as observed (in the Table 4) by 1.07% from (mean  $\pm$  SD)  $32.04 \pm 5.12$  to  $31.70 \pm 5.07$ . Where the value of p, the result is not significant at p > than 0.05

A small decrease in waist as shown (in Table 4) by 0.29% from (mean  $\pm$  SD)  $96.4 \pm 6.93$  (95% CI: (-6.34), to 7.22, where the value of p > 0.05. So the null hypothesis is rejected.

## 4. Discussion

The results show that the intake of 25 g/ day fiber for women and 38 g/ day for men during one month resulted in insignificant weight, BMI, and waist percentage reduction (P > 0.05). Fiber is always associated inversely with body fat and body weight. Furthermore, fiber intake is also inversely associated with BMI at different levels of heavy fat intake after collaborating for confounding aspects [12].

In this study 140 participants consumed diet high in dietary fiber and the effects on weight, BMI, and waist were considered among these participants. There are equivocal results from previous studies. Body weight reduction is usually described by satiety or decreased intake of food after eating fibrous food. The results explain that the use of fiber with vegetables, fruits, whole grains, and legumes, and throughout the life is considered to be very crucial. There are different mechanisms which have been suggested in order to make a clear idea about the usage of fiber aids for the purpose of weight reduction and decreasing absorption of macronutrients. Many mechanisms

have been suggested for how fiber aids in weight management, decreasing absorption of macronutrients, including promoting satiation and changing secretion of specific hormones [13].

The sample was collected from different age groups and examined their food intake in different time intervals.

The results of study support the fat mass regulation and body weight, which are produced due to interplay of different factors which includes peripheral sensation stimuli, central nervous circuits, chemical and mechanical satiation signals rising in the afferent vagal input and tract of gastrointestinal. The study focuses on the trend of obesity in different age groups [13].

Another study shows that today's diet has changed as it is becoming more common, for example, food from takeaway establishments; also, the intake of high-fat products, and animal calorie sweeteners with low consumption of fiber from fruits, vegetables or whole grains creating a substantial problem. Obesity is the balance between excessive food energy intake and expenditure, from information above, the only way to prevent or treat obesity is to reduce caloric intake and increases energy expenditure through physical activity. It decreases the size of portions at each meal as an X variable and increase physical activity as a variable Y to make the equation lean more towards a healthy life [14].

Another study, in support of this study results shows that the dietary fiber food or is a powerful ally to prevent or tackle obesity. One of the recommendations made in relation to the daily diet, is precisely replace foods high in fat and sugar for those high in dietary fiber, which are obtained from the consumption of whole fruits, leafy vegetables, whole grains, beans unstrained and meats. Foods high in fiber also have the ability to hold water and require more chewing and salivation, which is why they cause satiety The fiber produces a reduction of gastric emptying and delayed so desires to consume food [15].

According to one more study, it is recommended to consume daily foods rich in dietary fiber, distributed in different meals, with the ingestion of fruits and vegetables along with their skins, where possible, because it is where the greatest amount of fiber is stored, and also consume citrus fruits with skins and/or take the juices without straining [16].

Limitation of the study included the short time period for the intervention as well as the absence of additional information of the subjects such as genetics, dietary habits and physical activity levels. Nevertheless, this study may have some future clinical benefits in Body Weight and Waist Circumference reduction when a high fiber diet is consumed.

## 5. Conclusions

Even though there was no statistically significant difference between a high fiber diet and Body Weight, BMI and Waist Circumference, the small clinical decreases in those parameters may be a promising future indication to continue consuming a diet high in fiber. Additionally, people will continue benefit of consuming a diet high in fiber in order to avoid future medical health problems, such as, cancer, diabetes type 2, cardiovascular diseases and metabolic syndrome.

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