

Effect Of Nutrition Education on Anthropometric and Blood Glucose, Lipid Levels Among Obese Women

Hoda A. Abdelsalam¹, Hala M. Abdelsalam²; Zeinab A. AbdElaal³; Wafaa A. Fahmy⁴; Azza O. L. Saleh⁵

Nutrition and Food Science¹, Clinical Pathology² and Public Health^{3,4}, Environmental Medical sciences⁵, National Nutrition Institute (NNI), Egypt.

Zeinabbas.8@gmail.com

Abstract: Introduction: The prevalence of obesity is increasing worldwide. The prevalence of overweight and obesity in Egypt ranges from 74% to 86% in women and 69% to 77% in men. These data indicate a much higher prevalence of obesity among adult women, while overweight is more marked among adult men. One of the debatable issues which cause obesity is the meal frequency. **Objective:** The present study aimed to investigate the effect of nutritional education and increasing the meal frequency into six or more meals on weight loss and some health markers improvement. **Methods:** The present pre-post study was conducted on 100 females with BMI of ≥ 30 aged from 20- 55 years old who are attending obesity outpatient clinic in NNI in a period of 3 months. Eating behavior was assessed using 24 hours food recall. All subjects were subjected to anthropometric, laboratory measurements in the form of (Fasting, 2 hours postprandial glucose level, Lipid profile which include serum cholesterol, triglyceride, high density lipoprotein and low density lipoprotein) and dietary education. Afterwards, they were required to have 6 meals per day. In the second visit, all subjects were subjected to anthropometric, laboratory measurements. **Results:** Increasing the meal frequency and nutritional education led to reduction in BMI, waist circumference, serum FBS, 2hpp, TG, and total Cholesterol, these changes were statistically significant. Despite the decrease in LDL, these changes were not statistically significant. **Conclusion:** The increase in the meal frequency and nutrition education led to reduce in Anthropometric measurements and improvement in serum glucose and lipid profile control.

[Hoda A. Abdelsalam, Hala M. Abdelsalam; Zeinab A. Abd Elaal; Wafaa A. Fahmy; Azza O. L. Saleh. **Effect Of Nutrition Education on Anthropometric and Blood Glucose, Lipid Levels Among Obese Women.** *J Am Sci* 2014;10(10):35-39]. (ISSN: 1545-1003). <http://www.jofamericanscience.org>. 7

Key Words: Meal frequent; Education; obesity.

1. Introduction

Obesity is one of the most prevalent nutrition disorders with increasing trend among people of all ages in all over the world [1].

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. The body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m^2). A person with a BMI of 25 or more is considered by WHO to be overweight, while obesity is defined as having a BMI of 30 or more. Overweight and obesity are potent risk factors for cardiovascular diseases and type 2 diabetes and are major contributors to premature deaths. These metabolic disorders are dramatically increasing among adults in the Eastern Mediterranean Region. Data for adults aged 15 years and older from 16 countries in the Region show the highest levels of overweight and obesity in Egypt, Bahrain, Jordan, Kuwait, Saudi Arabia and United Arab Emirates. The prevalence of overweight and obesity in these countries ranges from 74% to 86% in women and 69% to 77% in men. These data indicate a much higher prevalence of obesity among adult

women, while overweight is more marked among adult men. (2).

Changes in dietary eating and physical activity are considered as the major causes of increasing trend of obesity prevalence [3]. Some eating behaviors such as meal frequency, skipping breakfast, distribution of eating occasions throughout the day have been suggested to influence weight [3]. In the recent years, the studies about meal frequency and its effects on various aspects of health have been encouraged [4]. Some of these studies which have been conducted on animal models have shown the effects of meal frequency on body composition [4,5-7]. So experts believe that less meal frequency and higher amounts of food in each meal lead to an increase in fat synthesis and finally obesity [8]. Unfortunately, there is limited information about the effects of meal frequency on body composition, different health markers, thermic effect of food, energy consumption, nitrogen balance, and satiety in human [4] and the results of studies investigating the relationship between meal frequency and weight/body composition have been criticized because of underestimation of calorie intake which is especially common among obese people [9]. Even in the studies in which the effect of underestimation was

eliminated, a significant negative relationship was reported between meal frequency and BMI as well as abdomen to hip ratio [9]. However, no significant relationship was reported between meal frequency and its effects on weight loss when calorie intake was less (about 700 calories per day). Both the people who ate one meal per day and those who ate 9 meals per day lost 5% of their weight in a 2 month period [10-14]. Other studies on obese [15] and normal individuals [16] have investigated the effects of 8 meals per day in comparison to one meal per day and concluded that eating food in more meals induced a significant difference in blood lipid, glucose, cholesterol, and hormonal levels.

2. Material and Methods

Study design

An intervention study for 100 obese females aged from 20- 55 years old who are attending obesity outpatient clinic in NNI. BMI of all the subjects were more than 30. [11]. We excluded people who were diabetics or case of chronic disease or used any specific drugs. Eating behavior and dietary intake were assessed using 24hours food recall. All participants receive dietary education. Weight (to the nearest 0.1 kgm) and height to the nearest 0.5 cm) and Waist circumferences (in cm): were measured. Weight and height for adults were used to compute BMI {wt (kg)/Ht² (meter)} WHO, 2000 [1].

Venous blood samples were taken using venous retention needles prior and at the end of the study and analyzed for, Fasting, 2 hours postprandial glucose level, Lipid profile which include serum cholesterol, serum triglyceride, high density lipoprotein cholesterol and low density lipoprotein cholesterol). In the second visit, all subjects were subjected to anthropometric measurement, laboratory measurement. Individuals were called every 2 weeks and were encouraged to continue their follow up.

Data were analyzed in SPSS, version 16. Paired t-test was used for comparison of the measurements before and after the study.

Contents and procedure of nutrition education

Diet planning

- Energy requirement was prescribed by physicians for each subject based on the subject's height, weight, and activity level according to the guidelines of ICMR (RDA).

- Energy distribution was set in accordance with Korean Dietetic Association recommendation (protein 15-20%, fat 20-25%, carbohydrate 55-60%).

- Individualized diet planning using food exchange system was given considering food preference and dietary behavior shown in the results of FFQ and dietary behavior questionnaire. Then they were trained on how to distribute their daily energy into 6 meals. They were educated to divide the exchange of grain, meat and substitution, dairy, fat and fruit to 6. In each meal they ate 1/6 of the exchange for each food groups.

Curriculum of nutrition education

The curriculum of nutrition education was structured to provide an understanding of meal planning and dietary recommendation. The purpose of this program was to encourage and support self-management leading to long-term adherence to diet recommendation.

Procedures of nutrition education

The nutrition education program consisted of one session for 1 to 2 hours long according to individualized diet prescription and was performed in a small group of 4~5 patients.

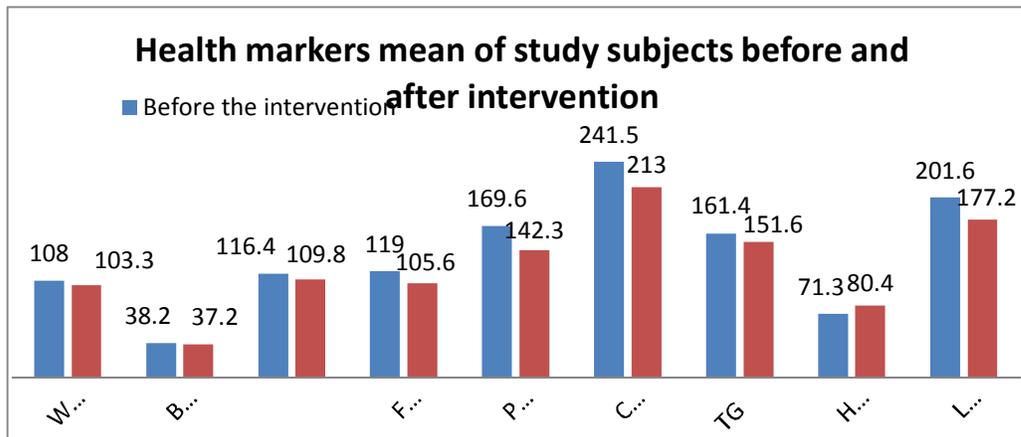
3. Result:

In this study, the average baseline age for females was 32.8 years, In addition, the average BMI of the female subjects at the beginning of the study was 38.22m/kg².

Table (1) shows the anthropometric indices of the selected subjects. The data clearly indicates that the BMI of the subjects before nutrition education was 38.22 m/kg² which were reduced to 37.19m/kg² after nutrition education. Also there was reduction in weight and waist circumference means from 108.00 kg, 116.35cm before nutrition education to 103.32kg, 109.8cm respectively with a statistical significance at one per cent level.

Table 1: Mean ± SD of the health markers in study subjects before and after intervention.

items	Before the intervention	after the intervention	Significance
Weight	108.0±16.042	103.3 ±18.11070	.000
BMI	38.2±6.17832	37.2 ±6.05962	.000
Waist	116.4±16.177	109.8 ±10.09250	.000
FBS	119.0±6.769	105.6 ±4.31435	.000
PPBS	169.6±17.297	142.3 ±12.94877	.001
Cholesterol	241.5±34.968	213.0 ±16.14705	.000
TG	161.4±6.277	151.6 ±8.32503	.000
HDL	71.3 ±8.32503	80.4 ±5.46499	.000
LDL	201.6±172.865	177.2 ±11.00308	.269



Biochemical changes

The means of blood parameters (Fasting, 2 hours postprandial glucose level, cholesterol, triglyceride, high density lipoprotein and low density lipoprotein) were reduced from (119.06±6.76 - 169.55±17.29 - 241.46±34.96 - 161.43±6.277 - 71.28 ±8.32503 - 201.±172.865) respectively before education to (105.5500±4.31435 - 142.3100±12.94877 - 213.0000±16.14705, 151.6300± 8.32503 - 80.4500±5.46499 - 177.2300±11.00308) after education. It was observed that there was astatistical significance at one per cent level for all parameters except low density lipoprotein which was insignificance.

4. Discussion

In the current study, having 6 meals per day and dietary education led to a significant reduction in weight and BMI compared to the traditional 2- 3 meals per day diet. The results of the studies investigating the effect of meal pattern on weight loss are inconsistency [4,17,18]. The findings of most of the previous studies are limited because of short duration and small sample size [4].

These findings are in agreement with those reported by Ma *et al.* [3] and Franko *et al.* [7]. Ma *et al.* [3] investigation indicated that having 4 or more meals per day was associated with a lower risk of obesity [3]. Furthermore, Franko *et al.* [8] performed a study on 2375 females in order to investigate the effect of meal frequency on body weight. After adjustment for calorie intake and age, they found that the subjects who ate 3 meals per day had a significantly lower BMI in comparison to those who ate 2 meals per day [7]. The reduction in BMI follow higher meal frequency may be because of increase in

TEF (Thermal effect of food) [19] or appetite regulation [20].

The findings of the current research showed that increasing the meal frequency led to a decrease in serum TG, total cholesterol,(with significant different) and LDL,(with insignificant different). Our result is similar to most of previous studies. Gwinup *et al.* [21,22] carried out some descriptive researches to investigate the effect of nibbling versus gorging on serum lipid profile and glucose in humans. In a study, 5 hospitalized females and males were trained to consume their meals in 3 manners; first in one meal, then in 10 meals, and finally in 3 meals, and energy and composition were the same in the 3 diets. In that study, each diet was continued for 14 days and the results showed that the one meal per day diet led to increase in blood lipid profile, while the 3 and 10 meals per day diets induced a small decrease in serum lipid, such as serum phospholipids, esterified fatty acids, and cholesterol. Furthermore, the findings of a cross sectional study showed that as the meal frequency increase, either total cholesterol or LDL cholesterol level decrease even after adjustment for the confounding factors. In addition, both mean total cholesterol and LDL in the subjects eating more than 6 meals per day were 5% less than those who just ate 1 or 2 meals per day. Similarly, Edelstein *et al.* [23] reported that those who ate 4 or more meals per day had significantly less total and LDL cholesterol compared to those who ate 1 or 2 meals. In meal patterns with higher meal frequency energy is providing continuously for the cells, so releasing free fatty acid from fat tissue for sourcing energy, which occur in fasting, decreases [24]. Also it may be related to weight loss induced as the result of increasing meal frequency as weight loss is

accompanied with resistance to insulin and finally serum lipid impairment.

The results indicate a decrease in FBS and 2hpp glucose following 6 meals pattern for 6 months compared to traditional meal pattern. This result is similar to that of Gwinup *et al.* [21] who reported lower serum glucose and insulin secretion when the participants were administered 4 smaller meals with 40-minute intervals in comparison to one large meal. Moreover, Jenkins *et al.* [25] investigated blood glucose changes in response to meal frequency and found that the diet containing 17 snacks and diet with 3 meals had similar effects on blood glucose changes; however, the serum insulin showed a significant decrease in the 17-snack diet. This is because of increase in meal pattern which means lower free fatty acid in serum which induces resistance to insulin and lower glucose tolerance [21,22].

Conclusion

Our data indicate that 6 meals pattern and dietary education in comparison to the current meal pattern (2-3 meals per day) led to weight loss and improve in Serum lipid profile control and serum sugar.

References

- Holmback I, Ericson U, Gullberg B, Wirfalt E (2010) A high eating frequency is associated with an overall healthy lifestyle in middle-aged men and women and reduced likelihood of general and central obesity in men. *Br J Nutr* 104:1065-1073.
- World Health Organization WHO (2010) Framework for the implementation of the Global Strategy on Diet, Physical Activity and Health in the Eastern Mediterranean Region, Working document WHO-EM/HLP/045/E/03.10/50.
- Ma Y, Bertone ER, Stanek EJ 3rd, Reed GW, Hebert JR, *et al.* (2003) Association between eating patterns and obesity in a free-living US adult population. *Am J Epidemiol* 158: 85-92.
- Mattson MP (2005) The need for controlled studies of the effects of meal frequency on health. *Lancet* 365: 1978-1980.
- Fabry P, Hejl Z, Fodor J, Braun T, Zvolankova K (1964) The Frequency of Meals. Its Relation to Overweight, Hypercholesterolaemia, and Decreased Glucose-tolerance. *Lancet* 2: 614-615.
- Metzner HL, Lamphiear DE, Wheeler NC, Larkin FA (1977) The relationship between frequency of eating and adiposity in adult men and women in the Tecumseh Community Health Study. *Am J Clin Nutr* 30: 712-715.
- Franko DL, Striegel-Moore RH, Thompson D, Affenito SG, Schreiber GB, *et al.* (2008) The relationship between meal frequency and body mass index in black and white adolescent girls: more is less. *Int J Obes (Lond)* 32: 23-29.
- Verboeket-van de Venne WP, Westerterp KR (1991) Influence of the feeding frequency on nutrient utilization in man: consequences for energy metabolism. *Eur J Clin Nutr* 45: 161-169.
- Ruidavets JB, Bongard V, Bataille V, Gourdy P, Ferrieres J (2002) Eating frequency and body fatness in middle-aged men. *Int J Obes Relat Metab Disord* 26: 1476-1483.
- Bortz WM, Wroldsen A, Issekutz B Jr, Rodahl K (1966) Weight loss and frequency of feeding. *N Engl J Med* 274: 376-379.
- Finkelstein B, Fryer BA (1971) Meal frequency and weight reduction of young women. *Am J Clin Nutr* 24: 465-468.
- Garrow JS, Durrant M, Blaza S, Wilkins D, Royston P, *et al.* (1981) The effect of meal frequency and protein concentration on the composition of the weight lost by obese subjects. *Br J Nutr* 45: 5-15.
- Verboeket-van de Venne WP, Westerterp KR (1993) Frequency of feeding, weight reduction and energy metabolism. *Int J Obes Relat Metab Disord* 17: 31-36.
- Young CM, Scanlan SS, Topping CM, Simko V, Lutwak L (1971) Frequency of feeding, weight reduction, and body composition. *J Am Diet Assoc* 59: 466-472.
- Kudlicka V, Fabry P, Dobersky P, Kudlickova V (1966) Nibbling versus Meal Eating in the Treatment of Obesity. *Proceedings of the Seventh International Congress of Nutrition, Hamburg* 2: 246.
- Jenkins DJ, Wolever TM, Vuksan V, Brighenti F, Cunnane SC, *et al.* (1989) Nibbling versus gorging: metabolic advantages of increased meal frequency. *N Engl J Med* 321: 929-934.
- Palmer MA, Capra S, Baines SK (2009) Association between eating frequency, weight, and health. *Nutr Rev* 67: 379-390.
- La Bounty PM, Campbell BI, Wilson J, Galvan E, Berardi J, *et al.* (2011) International society of sports nutrition position stand: meal frequency. *J Int Soc Sports Nutr* 8: 4.
- Farshchi HR, Taylor MA, Macdonald IA (2005) Beneficial metabolic effects of regular meal frequency on dietary thermogenesis, insulin sensitivity, and fasting lipid profiles in healthy obese women. *Am J Clin Nutr* 81: 16-24.
- Leidy HJ, Campbell WW (2011) The effect of eating frequency on appetite control and food

- intake: Brief synopsis of controlled feeding studies. *J Nutr* 141: 154-157.
21. Gwinup G, Byron Rc, Roush W, Kruger F, Hamwi Gj (1963) Effect Of Nibbling Versus Gorging On Glucose Tolerance. *Lancet* 2: 165-167.
 22. Gwinup G, Byron RC, Roush WH, Kruger FA, Hamwi GJ (1963) Effect Of Nibbling Versus Gorging On Serum Lipids In Man. *Am J Clin Nutr* 13: 209-213.
 23. Edelstein SL, Barrett-Connor EL, Wingard DL, Cohn BA (1992) Increased meal frequency associated with decreased cholesterol concentrations; Rancho Bernardo, CA, 1984-1987. *Am J Clin Nutr* 55: 664-669.
 24. Arnold LM, Ball MJ, Duncan AW, Mann J (1993) Effect of isoenergetic intake of three or nine meals on plasma lipoproteins and glucose metabolism. *Am J Clin Nutr* 57: 446-451.
 25. Jenkins DJ, Ocana A, Jenkins AL, Wolever TM, Vuksan V, et al. (1992) Metabolic advantages of spreading the nutrient load: effects of increased meal frequency in non-insulin-dependent diabetes. *Am J Clin Nutr* 55: 461-467.

7/19/2014