

Dietary Approach to Weight Loss

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Abstract: Obesity one of the most important public health problems worldwide. Weight reduction depends upon food eaten, type of food eaten, timing of meals, and amount of food eaten. A low-calorie diet with a low fat or carbohydrate content, ketogenic diet or high-protein diet has been recommended for weight reduction, although the potential risks and long-term effectiveness remain unknown. Meal timing is also an important factor in weight management, and higher-calorie breakfasts in combination with overnight fasting may help to prevent obesity. This review summarizes type of food eaten weight loss and weight-loss management based on these components.

Keywords: body mass index (BMI)

1. Introduction

Obesity has become one of the most important public health problems worldwide. ^(1, 2) Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health as a body mass index (BMI) of 25 kg/m² to 29.9 kg/m² and obesity as a BMI of 30 kg/m². Current estimates are that 69% of adults are either overweight or obese, with approximately 35% obese. ^(3, 4) BMI and waist circumference cut points that are used for determining risk in overweight and obese adults across diverse populations; the impact of weight loss on risk factors for CVD and type 2 diabetes, as well as CVD morbidity and mortality; optimal behavioral, dietary intervention, and other lifestyle treatment approaches for weight loss and weight loss maintenance; and benefits and risks of various bariatric surgical procedures. ^(3, 5-8) Overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings. ⁽⁹⁾ Overweight and obesity continue to be highly prevalent, especially in some racial and ethnic minority groups, as well as in those with lower incomes and less education. ⁽¹⁰⁾ Latest data from the National Health and Nutrition Examination Surveys indicate that for both men and women, obesity estimates for 2009 and 2010 did not differ significantly from estimates for 2003 to 2008 and that increases in the prevalence rates of obesity appear to be slowing down or leveling off ⁽⁶⁾. Nevertheless, overweight and obesity continue to be highly prevalent, especially in some racial and ethnic minority groups, as well as in those with lower. ⁽¹¹⁾ The prevalence of overweight and obesity in kingdom of Saudi Arabia between 13.6 and 57%. It has been observed that prevalence of overweight and obesity is higher in female compare to male. ⁽¹²⁻¹⁵⁾ Dietary interventions remain the cornerstone of weight-management strategies and the literature review was conducted to investigate type of food eaten in detail which includes low fat diet, low carbohydrate diet, ketogenic diet, high protein diet and Mediterranean diet.

1) Approaches to Low-Fat Diet

The Low-fat diet Characterized Consumption of fat as low as 15%-20% of daily calories, especially saturated fatty acids as low as 7%-10% Mostly plant-based meals. ⁽¹⁶⁾ The total dietary fat content to less than 30% of the energy reduce the prevalence of obesity, ischemic heart disease and certain cancers. ⁽¹⁶⁾ Low-density lipoprotein cholesterol level was reduced among individuals with obesity who followed a low-fat diet, triglyceride level increased and high-density lipoprotein cholesterol levels decreased. ⁽¹⁷⁾ Thus, diets low in saturated fatty acids, as well as those supplemented with good-quality fat and fibers, are a reliable and healthy strategy for people with obesity to achieve weight management and to prevent some types of cancer (including colorectal cancer and breast cancer) when combined with total calorie restriction. ^(18, 19) In meta-analysis, based on 19 controlled, ad libitum, low-fat, 2 ± 12-month intervention studies, shows that ad libitum, low-fat diets cause weight loss. The effect is more pronounced in subjects with a higher initial body weight. The meta-analysis revealed a 3.2kg greater weight loss as a result of consuming a low-fat ad libitum diet. A decrease in the body weight of this magnitude in the general population could reduce the prevalence of obesity from 25% to 15%. ³⁵ Even a few kilograms weight loss on a low-fat diet may, therefore, have an important public health impact, but increases in daily physical activity would also be desirable to strengthen the effect of preventive efforts. ⁽²⁰⁾

2) Approaches to Ketogenic Diet

Ketogenic diet is characterized by consumption of carbohydrates as low as 10% of daily calories or less than 50 mg/day which may decrease appetite, but long-term safety is unknown. ⁽²¹⁾ Ketogenic diets may decrease appetite and increase lipolysis, which may result in greater metabolic efficiency for fat consumption and can provide the same thermic effects as proteins. ⁽²¹⁾ In one study, ketogenic diet showed mixed effects on Low-density lipoprotein cholesterol level and was not superior to other dietary interventions for weight loss. ⁽²²⁾ Ketogenic diet can suppress hunger during calorie restriction and may have some

therapeutic effects on type 2 diabetes mellitus, polycystic ovary syndrome, and cardiovascular and neurological diseases. However, more evidence is required to confirm its effectiveness and safety.^(37, 41, 42) Similar to very low-calorie ketogenic diet, ketogenic diet is contraindicated in pregnant women; those with type 1 diabetes mellitus, kidney failure, or cardiac arrhythmia; and in older patients with frailty.⁽²¹⁻²³⁾

3) Approaches to Low carbohydrate Diet

Low carbohydrate diet characterized by consumption of carbohydrate less than 45% of daily calories or 130mg per day.⁽²⁴⁻²⁶⁾ It is use full dietary strategy for type two diabetes mellitus for weight loss.⁽²⁷⁾ The low carbohydrate diet increased HDL cholesterol levels more than the high carbohydrate diet (9% vs.6%, P=0.02); decreased triglyceride levels similarly, by 12 to 17%; decreased fasting serum insulin levels by 6 to 12%; Blood pressure decreased from baseline by 1 to 2 mm Hg, with no significant.^(28, 29) Recently, low-carbohydrate and high-protein diets have become popular as an aid to weight loss. Significant weight loss on a low-carbohydrate and high-protein diets without significant elevations of serum cholesterol has been reported.⁽³⁰⁻³²⁾ In this 12-month weight loss diet study, there was no significant difference in weight change between a healthy low-fat diet vs a healthy low-carbohydrate diet, and neither genotype pattern nor baseline insulin secretion was associated with the dietary effects on weight loss.⁽³³⁾ Several studies⁽³⁴⁻³⁷⁾ have been showed that baseline insulin dynamics may explain differential weight loss success obtained via low-fat diet vs a low-carbohydrate diet. For example, individuals with greater insulin resistance may have better success with low-carbohydrate diets due to the decreased demand on insulin to clear a lower amount of dietary carbohydrate delivered to the circulation. However, these studies were limited by relatively small sample sizes or post hoc analyses of the results.⁽³⁴⁻³⁷⁾

4) Approaches to high Protein Diets

The high protein diet characterized by protein intake more than 30% of total body calories or 1 to 1.2 grams per kilogram of body weight.⁽³⁸⁾ The high protein diet has been useful in increasing satiety and maintaining weight loss.⁽³⁹⁻⁴¹⁾ In Wycherley et al., 2012, and Leidy et al., 2015, often recommended high protein intake during diet-induced weight loss because it helps preserve lean tissue mass,^(42, 43) In Smith et al., 2015, Krebs et al., 2002, Robinson et al., 2014 data from a series of studies suggest that high protein intake could have detrimental metabolic effects; acute intravenous amino acid infusion or protein ingestion reduces insulin sensitivity.^(44, 45) Some studies have indicated that high intakes of protein and fat can increase the risk of Type two diabetes mellitus⁽⁴⁶⁾ and potential risk to the kidneys due to their associated protein-induced acid loads, such as the sulfuric acid produced from oxidation of methionine and cysteine.⁽⁴⁷⁾ Therefore, high protein diet from animal should be taken with caution for people with risk of chronic kidney disease.⁽⁴⁸⁾ The habitual high protein intake is associated with insulin resistance and an increased risk of developing Type two diabetes mellitus.⁽⁴⁹⁾ However, in Rietman et al., 2014, Wycherley et al., 2012, data showed the effect of increased protein intake per se on weight-loss induced changes in insulin sensitivity and glucose homeostasis are not known because of the confounding effects of differences

in weight loss and food selection and overall diet composition (e. g., consumption of dairy and meat products and saturated and unsaturated fatty acids) between groups in studies that compared high protein with standard protein diets.^(42, 50)

5) Approaches to Mediterranean Diet

The Mediterranean diet is consisted of a high intake of olive oil, fruit, nuts, vegetables, and cereals; a moderate intake of fish and monounsaturated fat; a low to no consumption of dairy products, red meat, processed meats, and sweets; as well as wine in moderation, consumed with meals.⁽⁵¹⁾ In the Lyon Diet Heart Study⁽⁵²⁾ and other cohort studies^(53, 54) adherence to the Mediterranean diet has been consistently beneficial with cardiovascular risk.⁽⁵³⁻⁵⁵⁾ A systematic review of the Mediterranean diet shows the most likely dietary model to provide protection against coronary heart disease.⁽⁵⁶⁾ Observational cohort studies and a secondary prevention trial shows, Mediterranean diet the energy unrestricted, but has substantial reduction in the risk of major cardiovascular events among high-risk persons. The results support the benefits the Mediterranean diet for the primary prevention of cardiovascular disease.⁽⁵⁷⁾ The effectiveness of the Mediterranean diet for weight loss and preventing cardiovascular disease is supported by sufficient evidence.^(58, 59) Its benefits may extend to the reduction in cancer risk and significant reduction in digestive cancer risk.⁽⁶⁰⁾ Additionally, adherence to a Mediterranean diet may improve cognitive function and decrease the risk of dementia, although the evidence supporting this association is weak to moderate.⁽⁶¹⁾ One systematic review of the Mediterranean diet for long-term weight loss reported similar results to other diets despite greater weight loss than with a low-fat diet after 12 months.⁽⁶²⁾

2. Conclusion

Weight loss likely similar with differing macronutrient percentages. During weight loss, low carb and low-fat diet with normal amounts of protein cause improvements in cardiometabolic risk factors. High protein diet likely has negative effects on skeletal muscle insulin sensitivity. Mediterranean diet associated with decreased cardiovascular risk even in weight stable diet. Moderate carbohydrate intake associated with decreased mortality.

References

- [1] Egger G, Dixon J. Beyond obesity and lifestyle: a review of 21st century chronic disease determinants. *Biomed Res Int* 2014; 2014: 731685.
- [2] Smith CJ, Perfetti TA, Hayes AW, et al. Obesity as a source of endogenous compounds associated with chronic disease: a review. *Toxicol Sci* 2020; 175: 149-55.
- [3] Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. The Evidence Report. National Institutes of Health. *Obes Res* 1998; 6 Suppl 2: 51S-209S.
- [4] Flegal KM, Carroll MD, Kit BK, et al. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA* 2012; 307: 491-7.

- [5] E. A. Finkelstein, J. G. Trogon, J. W. Cohen, et al. Annual medical spending attributable to obesity: payer-and service-specific estimates Health Aff (Millwood), 28 (2009), pp. w822-w831
- [6] D. C. Goff Jr., D. M. Lloyd-Jones, D'Agostino RB. Sr, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk J Am Coll Cardiol, 63 (2014), pp.2935-2959.
- [7] R. H. Eckel, J. M. Jakicic, J. D. Ard, et al. 2013 AHA/ACC guideline on lifestyle management to reduce cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines J Am Coll Cardiol, 63 (2014), pp.2960-2984.
- [8] N. J. Stone, J. Robinson, A. H. Lichtenstein, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines J Am Coll Cardiol, 63 (2014), pp.2889-2934.
- [9] https://www.who.int/health-topics/obesity#tab=tab_1
- [10] Ogden CL, Carroll MD, Kit BK, et al. Prevalence of obesity in the United States, 2009-2010. NCHS Data Brief 2012: 1-8.
- [11] Michael D Jensen, Donna H Ryan, Caroline M Apovian et al. JACC Vol.63, No.25, 2014-2013 AHA/ACC/TOS Guideline for Obesity July 1, 2014: 2985-3023-2988.
- [12] Abdulwahed Al-saeed, Hassan Ali Al Gazwi, Murtaga Makki, et al. Weight Loss as an Integral Part of Obesity & Metabolic Syndrome Management. international Journal of Science and Research (IJSR). Volume 8 Issue 6, June 2019.
- [13] Bahijri SM, Al Raddadi RM. The importance of local criteria in the diagnosis of metabolic syndrome in Saudi Arabia. TherAdvEndocrinolMetab 2013; 4: 51.
- [14] Gosadi IM. Assessment of the environmental and genetic factors influencing prevalence of metabolic syndrome in Saudi Arabia. Saudi Med J.2016; 37 (1): 12-20.
- [15] Al-Nozha M, Al-Khadra A, Arafah MR, et al. Metabolic syndrome in Saudi Arabia. Saudi Med J 2005; 26: 1918-1925.
- [16] Liu AG, Ford NA, Hu FB, et al. A healthy approach to dietary fats: understanding the science and taking action to reduce consumer confusion. Nutr J 2017; 16: 53.
- [17] Lu M, Wan Y, Yang B, et al. Effects of low-fat compared with high-fat diet on cardiometabolic indicators in people with overweight and obesity without overt metabolic disturbance: a systematic review and meta-analysis of randomised controlled trials. Br J Nutr 2018; 119: 96-108.
- [18] Ocvirk S, Wilson AS, Appolonia CN, et al. Fiber, fat, and colorectal cancer: new insight into modifiable dietary risk factors. Curr Gastroenterol Rep 2019; 21: 62.
- [19] Brennan SF, Woodside JV, Lunny PM, et al. Dietary fat and breast cancer mortality: a systematic review and meta-analysis. Crit Rev Food Sci Nutr 2017; 57: 1999-2008.
- [20] Astrup A, et al. The role of low-fat diets in body weight control: a meta-analysis of ad libitum dietary intervention studies. Obes Relat Metab Disord 2000 Dec; 24 (12): 1545-52.
- [21] Paoli A, Rubini A, Volek JS, Grimaldi KA. Beyond weight loss: a review of the therapeutic uses of very-low-carbohydrate (ketogenic) diets. Eur J Clin Nutr 2013; 67: 789-96.
- [22] Kirkpatrick CF, Bolick JP, Kris-Etherton PM, et al. Review of current evidence and clinical recommendations on the effects of low-carbohydrate and verylow-carbohydrate (including ketogenic) diets for the management of body weight and other cardiometabolic risk factors: a scientific statement from the National Lipid Association Nutrition and Lifestyle Task Force. J Clin Lipidol 2019; 13: 689-711.
- [23] Gibson AA, Seimon RV, Lee CM, et al. Do ketogenic diets really suppress appetite? A systematic review and meta-analysis. Obes Rev 2015; 16: 64-76.
- [24] van Zuuren EJ, Fedorowicz Z, Kuijpers T, et al. Effects of low-carbohydrate-compared with low-fat-diet interventions on metabolic control in people with type 2 diabetes: a systematic review including GRADE assessments. Am J Clin Nutr 2018; 108: 300-31.
- [25] Kelly T, Unwin D, Finucane F. Low-carbohydrate diets in the management of obesity and type 2 diabetes: a review from clinicians using the approach in practice. Int J Environ Res Public Health 2020; 17: 2557.
- [26] Dietary Guidelines Advisory Committee. Scientific report of the 2015 Dietary Guidelines Advisory Committee: advisory report to the secretary of health and human services and the secretary of agriculture. Washington (DC): U. S. Department of Agriculture; 2015.
- [27] Ge L, Sadeghirad B, Ball GD, et al. Comparison of dietary macronutrient patterns of 14 popular named dietary programmes for weight and cardiovascular risk factor reduction in adults: systematic review and network meta-analysis of randomised trials. BMJ 2020; 369: m696.
- [28] sacks F, George A. Bray, Vincent J. Carey et al. Comparison of Weight-Loss Diets with Different Compositions of Fat, Protein, and Carbohydrates. N Engl J Med 2009; 360: 859-873.
- [29] M. hession, C Rolland, U Kulkarni, et al. Systematic review of randomized controlled trials of low-carbohydrate vs. low-fat/low-calorie diets in the management of obesity and its comorbidities. obesity reviews 2009; 10: 36-50
- [30] Veech LR. The therapeutic implications of ketone bodies in pathological conditions: ketosis, ketogenic diet, redox states, insulin resistance, and mitochondrial metabolism. Prostaglandins Leukot Essent Fatty Acids.2004; 70: 309-319.
- [31] Layman DK, Clifton P, Gannon MC, et al. Protein in optimal health: heart disease and type 2 diabetes. Am J Clin Nutr 2008; 87: 1571S-1575S.
- [32] Volek JS, Fernandez ML, Feinman RD, et al. Dietary carbohydrate restriction induces a unique metabolic state positively affecting atherogenic dyslipidemia,

- fatty acid partitioning, and metabolic syndrome. *Prog Lipid Res* 2008; 47: 307-318
- [33] Gardner CD, John F T, Lina CDG, et al. Effect of Low-Fat vs Low-Carbohydrate Diet on 12-Month Weight Loss in Overweight Adults and the Association with Genotype Pattern or Insulin Secretion. *JAMA* 2018; 319 (7): 667-679
- [34] 34.1. Cornier MA, Donahoo WT, Pereira R, et al. Insulin sensitivity determines the effectiveness of dietary macronutrient composition on weight loss in obese women. *Obes Res*.2005; 13 (4): 703-709.
- [35] Ebbeling CB, Leidig MM, Feldman HA, et al. Effects of a low-glycemic load vs low-fat diet in obese young adults: a randomized trial. *JAMA*.2007; 297 (19): 2092-2102.
- [36] Pittas AG, Das SK, Hajduk CL, et al. A low-glycemic load diet facilitates greater weight loss in overweight adults with high insulin secretion but not in overweight adults with low insulin secretion in the CALERIE Trial. *Diabetes Care*.2005; 28 (12): 2939-2941.
- [37] McClain AD, Otten JJ, Hekler EB, Gardner CD. Adherence to a low-fat vs low-carbohydrate diet differs by insulin resistance status. *Diabetes Obes Metab*.2013; 15 (1): 87-90.
- [38] Halton TL, Hu FB. The effects of high protein diets on thermogenesis, satiety and weight loss: a critical review. *J Am Coll Nutr* 2004; 23: 373-85.
- [39] van Baak MA, Mariman EC. Dietary strategies for weight loss maintenance. *Nutrients* 2019; 11: 1916.
- [40] van Baak MA, Mariman EC. Dietary strategies for weight loss maintenance. *Nutrients* 2019; 11: 1916.
- [41] smith GI, Jun Yoshino, Shannon CK, et al. High-Protein Intake during Weight Loss Therapy Eliminates the Weight-Loss-Induced Improvement in Insulin Action in Obese Postmenopausal Women. *cell reports*.2016; 17 (3): 849-861
- [42] Wycherley TP, Moran LJ, Clifton PM, Noakes M, Brinkworth GD. Effects of energy-restricted high protein, low-fat compared with standard-protein, low-fat diets: a meta-analysis of randomized controlled trials. *Am J Clin Nutr*.2012; 96: 1281-98.
- [43] Michael D Roberts, C Brooks Mobley, Ryan G Toedebush, et al. Western diet-induced hepatic steatosis and alterations in the liver transcriptome in adult Brown-Norway rats; *BMC Gastroenterol*; 2015 Oct 30; 15: 151. doi: 10.1186/s12876-015-0382-3.
- [44] Smith GI, Yoshino J, Stromsdorfer KL, et al. Protein ingestion induces muscle insulin resistance independent of leucine-mediated mTOR activation. *Diabetes*.2015; 64: 1555-63.
- [45] Robinson MM, Soop M, Sohn TS, et al. High insulin combined with essential amino acids stimulates skeletal muscle mitochondrial protein synthesis while decreasing insulin sensitivity in healthy humans. *J Clin Endocrinol Metab*.2014; 99: E2574- 83.
- [46] Shan R, Duan W, Liu L, Qi J, et al. Low-carbohydrate, high-protein, high-fat diets rich in livestock, poultry and their products predict impending risk of type 2 diabetes in Chinese individuals that exceed their calculated caloric requirement. *Nutrients* 2018; 10: 77.
- [47] Reddy ST, Wang CY, Sakhaee K, et al. Effect of low-carbohydrate high-protein diets on acid-base balance, stone-forming propensity, and calcium metabolism. *Am J Kidney Dis* 2002; 40: 265-74.
- [48] Ko GJ, Rhee CM, Kalantar-Zadeh K, et al. The effects of high-protein diets on kidney health and longevity. *J Am Soc Nephrol* 2020; 31: 1667-79.
- [49] Linn T, Geyer R, Prassek S, et al. Effect of dietary protein intake on insulin secretion and glucose metabolism in insulin-dependent diabetes mellitus. *J Clin Endocrinol Metab*.1996; 81: 3938-43.
- [50] Rietman A, Schwarz J, Tome D, et al. High dietary protein intake, reducing or eliciting insulin resistance? *Eur J Clin Nutr*.2014; 68: 973-9.
- [51] Willett WC, Sacks F, Trichopoulos A, et al. Mediterranean diet pyramid: a cultural model for healthy eating. *Am J Clin Nutr*1995; 61: Suppl: 1402S-1406S.
- [52] de Lorgeril M, Salen P, Martin JL, et al. Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study. *Circulation* 1999; 99: 779-85.
- [53] Sofi F, Abbate R, Gensini GF, et al. Accruing evidence on benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis. *Am J Clin Nutr* 2010; 92: 1189-96.
- [54] Martínez-González MÁ, Hershey MS, Zazpe I, et al. Transferability of the Mediterranean diet to non-Mediterranean countries: what is and what is not the Mediterranean diet. *Nutrients* 2017; 9 (11): E1226.
- [55] De Lorgeril M, Salen P, Martin JL, et al. Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: final report of the Lyon Diet Heart Study. *Circulation* 1999; 99: 779-85.
- [56] Mente A, de Koning L, Shannon HS, et al. A systematic review of the evidence supporting a causal link between dietary factors and coronary heart disease. *Arch Intern Med* 2009; 169: 659-69.
- [57] Ramon Estruch, Emilio Ros, Jordi Salas-Salvado, et al. Retraction and Republication: Primary Prevention of Cardiovascular Disease with a Mediterranean Diet. *N Engl J Med* 2018; 378 (25): 2441-2
- [58] Sánchez-Sánchez ML, García-Vigara A, Hidalgo-Mora JJ, et. Mediterranean diet and health: a systematic review of epidemiological studies and intervention trials. *Maturitas* 2020; 136: 25-37.
- [59] Liyanage T, Ninomiya T, Wang A, et al. Effects of the Mediterranean diet on cardiovascular outcomes: a systematic review and meta-analysis. *PLoS One* 2016; 11: e0159252.
- [60] Barak Y, Fridman D. Impact of Mediterranean diet on cancer: focused literature review. *Cancer Genomics Proteomics* 2017; 14: 403-8.
- [61] Petersson SD, Philippou E. Mediterranean diet, cognitive function, and dementia: a systematic review of the evidence. *Adv Nutr*.2016; 7: 889-904.
- [62] Mancini JG, Filion KB, Atallah R, et al. Systematic review of the Mediterranean diet for long-term weight loss. *Am J Med*.2016; 129: 407-15.