



EFFICACY OF LOW CARBOHYDRATE DIET IN WEIGHT LOSS

Dr. Meena Mehta

Department of Food Science & Nutrition, Dr. B.M. Nanavati College of Home Science, 338 R.A. Kidwai Marg, Matunga, Mumbai 400 019 INDIA

ABSTRACT

Low-carb diets are dietary programs that restrict carbohydrate consumption, for the treatment of obesity or diabetes. Such Ketogenic diet restrict carbohydrate intake sufficiently to cause ketosis. The term "low-carbohydrate diet" is applied to diets that restrict carbohydrates to less than 20% of caloric intake, but can refer to diets that simply restrict or limit carbohydrates to less than recommended proportions less than 45% of total energy coming from carbohydrates. Low-carbohydrate diets are used to treat or prevent some chronic diseases and conditions, including cardiovascular disease, metabolic syndrome, auto-brewery syndrome, high blood pressure, and diabetes. Generally obese and overweight subjects try to burn excess fat by exercise and highly restricted diet plan which may result in various other health complications. Present studies was planned to investigate the efficacy of low carb diet for the obese person. Survey was conducted and subjects were selected who agreed to follow the low carb diet. A study was planned for 8 weeks and diet counseling was arranged for the selected subjects. A positive response was observed for these subjects without any major complaints.

KEYWORDS : Low Carb Diet, Calorie Intake, Obesity]

Introduction

It is believed that fat intake in diet is a major cause of weight gain, but carbohydrate intake is the true reason for obesity and other weight gain complication. A low carb diet limits carbohydrates like grains, starchy vegetables and fruits which emphasize dietary protein and fat¹. Many types of low carb diet exists each with varying restrictions on the types and amounts of carbohydrates. A low carb diet is used to lose weight. Some low carb diets have health benefits beyond weight loss in addition to reducing risk factors associated with heart diseases, certain cancer, diabetes and metabolic syndrome².

A low carb diets are dietary program which restrict carbohydrate consumption for right control and treatment of obesity. Foods high in digestible carbohydrates are either limited or replaced with foods containing a higher percentage of proteins^{2,3}, fats and foods with low carbohydrate like fruits & vegetable. The amount of carbohydrate allowed varies with different low carb diets. Such diets restricts carbohydrate intake sufficiently to cause ketosis which is the induction phase of Atkin diet⁴. A low carb diet focuses on proteins and non starchy vegetables. Such diet excludes grains, beans, fruits, breads, sweets, pastas. A daily limit of 50-150gm of carbohydrate is normally recommended during the initial phase of treatment .Subsequently allowed carbohydrates are increased. Generally 900 to 1300Cal/day from carbohydrate are recommended . The concept of low carb diet for weight loss has Indian origin wherein diet begins with zero fat.

The paper aims to find the efficacy of low carb diet in weight loss experiment on subject visiting exercise in the fitness club at Borivali in Mumbai. The trails were carried out for 8 to 10 weeks. The details were also collected in terms of energy level and buoyancy at the completion of the 8 weeks period.

Methodology

Sample Selection: The subjects were selected from Your Fitness Club, Borivali who were attending club regularly for fitness purpose. Out of total, 30 subjects of whom 21 females and 9 males were selected randomly irrespective of race and religion. All the data were collected in the month of May to July 2012. The selected subjects were classified based on their BMI values. All the selected subjects were free from any medical complications. The selected subjects were informed about the low carb diet program and experiment on them.

The anthropometric measurements were recorded using standard method available in the literature. A pre-planned questionnaire was

formulated for collection of personal data and diet recall. The questionnaire consists of mainly general information, physical activity, diet recall and monitoring of weight measurement. All the subjects were consulted about their daily diet and weight was recorded. After completing 8 weeks of feeding low carb diet, subjects were interviewed and their opinion was recorded. Majority of the subjects found to respond positively to the low carb diet and found effective in weight loss. However, few of them could not show the expected loss in weight for which various causes and problems were discussed.

The subjects on diet were met every week for 8 weeks to study how their diet plan is progressing discussing difficulties faced and tweaking the menu with similar choices if subjects needed variations.

Results and discussion

Low carbohydrate diets are closer in the ancestral diet in human before the invention of agricultural and adopted to low carbohydrate diet. Cordain et.al⁵ reported that low carbohydrate of 22-40% of total energy from animal food is preferred over plant food since vegetables are generally high in carbohydrate. A very low carbohydrate ketogenic diet is the standard treatment for diabetes during 19th century. Diet for weight control designed with giving up bread, butter, milk, sugar, beer and potatoes⁶. Stern et.al⁷. reported the effect of low carbohydrate vs conventional weight loss diets in severely obese adults: one year follow-up of a randomized trial,

Low carbohydrate diet is the relationship between consumption of carbohydrates and its subsequent effect on blood sugar and production of specific hormones. Most diets are high nutritive carbohydrates which are digested to produce glucose in the blood stream are the primary control for insulin secretion. Insulin secretion can control ketosis. In non-ketogenic state the human body stores dietary fat in adipose tissues and uses glucose as cellular fuel. While low carbohydrate diet are low in nutritive carbohydrates evoke less insulin⁸.

The study consisted of 30 subjects of whom 21 were females and 9 males. BMI index indicated that 28 subjects were overweight and only 2 were obese. The personal information and 3 day diet recall were collected using preplanned questions. The daily calorie intake was averaged in the range of 1700 to 2400 Kcal. The results also indicate that major contribution of calorie in their diet consists of carbohydrate. The subjects were counseled and explained that overweight is due to excess consumption of diet containing carbohydrate. The subjects were convinced and explained the

benefits of reduction in carbohydrate in their diet.

Low carbohydrate diets differ⁴ in the specific amount of carbohydrate intake allowed whether certain types of foods are preferred whether occasional exceptions are allowed⁹. Low carbohydrate diets inherently require minimizing vegetable and fruit consumption which in turn robs the body of important nutrients. Sweet fruits do not represent significant source of carbohydrates in their natural form and contain a good amount of fiber which attenuates the absorption of sugar in the gut. Fructose sugar from fruits has negligible effect on insulin level. Low carbohydrate diet plans accommodate vegetables like broccoli, spinach cauliflower and pears.

Weinsier et.al.¹⁰ suggested therapeutic drugs for the reduction in body weight. However, such practices are not healthy since it leads to few other metabolic disorder and disturbance in the enzyme balance in the body. Most of the suggested low carb diets were cereal based. However, to avoid physical and mental discomfort carbohydrates based diets were gradually lowered along with moderation in fat and Protein intake was increased to meet exercising individual requirement to build more muscles and to increase BMR for the thermogenic effect of protein. A variety of non starchy fruits and cereals with higher legumes were major inclusion in the diet plan. A care was taken to maintain the time schedule for following such diet. The calorie intake was controlled by proper natural supplements and rich sources of antioxidants. The calories in the suggested diet ranged between 1400 to 1700Kcal. The following table summarizes the suggested change in diet of subjects wherein protein intake was increased to 22% and carbohydrates are lowered by 11%, while fat intake was maintained in the same ranged.

A proper low carb diet was planned and all the selected subjects were asked to follow the same strictly. The diet was adjusted with their liking and daily consumed staple food. A care was taken to include more protein and reduced fat along with appropriate amount of fruits and vegetables to maintain the minerals and vitamins level. All the subjects were asked to report about any discomfort and any need of change in the diet. With every meeting their body weight was monitored and proper record was maintained. The initial body weight of subjects was recorded and there after 4 weeks and the 8 weeks of low carb treatment was recorded and tabulated in Table 2. All the subjects were asked to continue their routine life style and follow the low carb diet strictly..

It was observed that social obligations including social gathering, business meetings and work related stress were prime reasons for not adhering to the prescribed low carb diet. This has negative impact on the weight loss experiment. Few subjects were unable to lose weight or had marginal weight loss due to change in appetite due to stress and anxiety. 90% of subjects felt that fat in food should be controlled rather than carbohydrate intake to reduce the body weight. 40% subjects felt that they can follow the low carb diet and shown faith in body weight loss program. 66% of the subjects supplemented that during low carb diet they felt more energized in daily routine activities. However, 16% of subjects accepted that loss in body weight is due to their diet habit while another 16% attributed weight loss solely to exercise.

In the first week of a low carbohydrate diet great deal of the weight loss comes from eliminating water retained in the body. However, it was short term effect and entirely separate from general weight loss that these diets can produce through eliminating excess body fat. Such diet cause weakness and most highly recommended exercise as a part of a healthy lifestyle.

Foster et.al.¹¹ reported in their randomized trial study on low carbohydrate diet that during 12 months the difference in weight loss was not significant but the HDL level was higher and TG lowered with low carb diets. The low carbohydrate diet is strongly associated with the Atkins diet. There is no widely accepted definition of what

precisely constitutes a low carbohydrate diet. Low carbohydrate diets are discussed with respect to body weight loss, Low carbohydrate diet s mitigate and prevent diabetes, metabolic diseases and epilepsy. The level of carbohydrate consumption defined as low carbohydrate is different from the level of carbohydrate defined by dietician. Carbohydrate intake reduces insulin production in the body and encourages ketosis in place of glucose. Ketosis is the stage in fat metabolism which is estimated when in liver is low on glycogen . The breakdown of fat during ketosis generate ketones like acetoacetate and β hydroxybutyrate used as fuel by tissues of the body. Heart and brain muscle prefer to use ketones over glucose. Glycemic index scale was created on a standard amount of carbohydrate per 50gm of food. **Brenham et.al.**¹² reported that very low carbohydrate diet help in losing more body weight and body fat during first 6 months .while all other blood parameter remained unchanged. Lipid level and TG level was reduced significantly while treating the patients with low carb diet reported by **Segal et.al.**¹³

The rise in carbohydrate consumption especially refined carbohydrate caused the epidemic levels of many diseases like diabetic type II. High carbohydrate diets require more insulin production as compared to low carbohydrate diet. The increasingly large percentage of calories consumed as carbohydrate led to increased incidence of metabolic disorders like diabetes II. In general, uncooked foods are hard o absorb and do not raise glucose level. Low glycemic index diets differ from low carbohydrate diet since all nutritive carbohydrates have the same effect on metabolism. The low insulin index diet is based on measurements of direct insulemic responses to food rather than glycemic responses. It is recommended to involve lowering nutritive carbohydrates.

Many risk factors like cardiovascular disorder and obesity are associated with the low carbohydrate and excess fat and protein diet. Foods are classified according to the rapidity of their effect of blood sugar levels with fast digesting simple carbohydrates causing a sharp increase and slow absorption of complex carbohydrate. The low carbohydrate can control fat absorption and eliminate trans fat. **Nordmann et.al.**¹⁴ . and **Dena et.al.**¹⁵ reported the Effect of low carbohydrate vs low fat diets on weight loss and cardiovascular risk factor: **Samaha et.al.**¹⁷ found that severely obese subjects with a high prevalence of diabetes and metabolic syndrome lost more weight by restricted carbohydrate intake. It lowered the TG level more effectively as compared with low fat diet.

All the studies indicate that low carb diet influences the body weight loss. Low carb diet is associated with decreased calorie intake and increased diet duration but not reduced carbohydrate content. Also low carb diet is effective and can be suggested for weight loss program¹⁰.

Conclusions:

The present investigation was undertaken with a view to observe weight reduction trends over 2 months on the low carbohydrate diet with exercise to understand what the weight loss clients feel they were put on a diet and gauge personal opinions of members with regards to their energy levels and weight loss at the end of 8 weeks..90^ of the members at the start of the diet regime were of the belief that only fat is bad and that it should be avoided in weight loss while carbohydrate consumption is not a cause of concern. The results showed that there was gradual weight loss in 26 subjects who stuck to the diet and exercise regime. The mean weight loss at 8 weeks was 3.2Kg. However, four members who were unable to lose weight since their inability in maintaining either diet and exercise or both due to social obligations, work and study related stress which affected their diet and exercise regimes.

It was found that 66% of the members felt more energetic in carry out their day to day activities at the end of 8 weeks.. 68% of the members attributed their weight loss to better eating patterns and exercise regime. The limitations of the study include not being able

to assess changes to biochemical parameters. It is also important to note that the carbohydrate levels in this study have been lowered for the members keeping in mind that the India diet is still predominantly carbohydrate based. The carbohydrate allowance is slightly higher than that in the very low carbohydrate western diets.

In nutshell present study confirmed the beneficial effects of low carbohydrate diet in effectively losing weight within 8 weeks at close supervision involving weekly consultations with the qualified dietician.

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Table 1 Summery of micronutrient and calorie intake

Macronutrient Intake	Carbohydrate (gm)	Protein (gm)	Fat (gm)	Total Calorie
Earlier diet	266-350	35-60	45-80	-
Suggested diet	150-190	65-95	45-60	-
Baseline Calorie	60%	8%	32%	1800-2400
Suggested Calorie	49%	22%	29%	1300-1700

Table 2 Weight (Kg) reduction trends over 8 weeks

Subject	Beginning	After 4 Weeks	After 8 Weeks	Loss in weight
Female				
1	74.0	72.0	70.0	4.0
2	66.0	65.0	62.9	3.1
3	90.0	90.0	89.8	0.2
4	63.0	62.5	60.0	3.0
5	58.0	56.5	52.9	5.1
6	66.0	65.7	65.3	0.7
7	63.2	62.7	59.1	4.1
8	81.4	81.4	81.3	0.1
9	69.8	68.8	66.2	3.6
10	57.0	56.1	56.0	1.0
11	73.0	72.1	70.1	2.9
12	64.9	62.1	60.7	4.2
13	75.3	75.3	73.0	2.3
14	76.3	74.0	72.1	4.2
15	90.0	89.5	87.8	2.2
16	74.2	73.9	72.1	2.1
17	62.0	60.0	59.8	2.2
18	69.3	68.7	67.9	1.4
19	88.3	87.4	85.4	2.9
20	78.0	77.1	74.2	3.8
21	71.7	71.2	70.2	1.5
Sum	1511.4	1492.0	1457.0	54.6
Average	71.95	71.05	69.38	2.60
Male				
22	89.9	88.0	86.0	3.0
23	96.3	94.7	91.3	5.0
24	90.0	87.2	83.1	6.9
25	81.3	80.8	80.2	1.1
26	77.4	77.1	75.0	2.4
27	82.0	80.7	81.2	0.8
28	83.4	80.0	80.7	2.7
29	77.4	77.1	76.8	0.6
30	77.8	75.7	74.6	3.2
Sum	755.5	741.3	728.9	25.7
Average	83.94	82.37	80.99	2.86
Sum	2266.9	2233.3	2185.7	80.3
Average	75.56	74.44	72.86	2.68

References

1. Dansinger, M. L.; Gleason, J.A; Griffith, J. L; "Comparison of the Atkins, Ornish, Weight Watchers, and Zone Diets for Weight Loss and Heart Disease Risk Reduction: A Randomized Trial, The Journal of the American Medical Association (2005). 293 (1): 43–53.

2. Larosa J.C., Fry A.G., Rosing D.R,"Effects of high protein, low carbohydrate dieting on plasma lipoprotein and body weight", J. Am. Diet. Asso. JADA, (1980),77(3), P.No. 264-270

3. Schwarzfuchs, Dan Henkin, "Weight loss with a low carbohydrate Mediterranean or low fat diet", New England J. of Medicine (2008), 359 (3) P.No. 229-241

4. Atkins, Robert, Dr. Atkins' New Diet Revolution, Revised Edition., (2003),. Evan. ISBN 978-1-59077-002-3

5. Cordain, L; Miller, J. B; Eaton, S. B; Mann, N.; Holt, S. H.; (2000). "Plant-animal subsistence ratios and macronutrient energy estimations in worldwide hunter-gatherer diets". The American Journal of Clinical Nutrition, (2000),71 (3): 682–692.

6. Merchant, A.T.; Shahzaib; Dehghan, Mahshid; Shah, Syed Mahboob Ali; "Carbohydrate Intake and Overweight and Obesity among Healthy Adults". Journal of the American Dietetic Association. (2009), 109 (7): 1165–72.

7. Stern I, Seshadri P, "The effect of low carbohydrate vs conventional weight loss diets in severely obese adults: one year follow-up of a randomized trial", Ann. Intern. Med., (2004), 140 P.No. 778-785.

8. Bueno, Nassib B."Very-low-carbohydrate ketogenic diet v. low-fat diet for long-term weight loss: a meta-analysis of randomized controlled trials." British Journal of Nutrition. (2011), 110: 1178–1187

9. Santos, F.L., Esteves, S. S., D'Costa Pereira, A., Yancy, W. S. and Nunes, J. P. L. "Systematic review and meta-analysis of clinical trials of the effects of low carbohydrate diets on cardiovascular risk factors". Obesity Reviews. (2008). 13: 1048–1066

10. Weinsier R.L., Wadden T.A., Johnson F.F, Wilmore J.H., "Recommended therapeutic guidelines for professional weight control program" A. J. Clin. Nutr. (1984), 40(10), 865-872.

11. Foster Gary D. Wyatt Hill J. O., McGuckin B.G. Daniel J. "A randomized trial of a low carbohydrate diet for obesity" New England J. of Medicine (2003), 348 (21) P. 2082-2090.

12. Brenham B. j. Seeley R.J. Daniels S.R. D'Alessio D.A " A randomized trial comparing a very low carbohydrate diet and a calorie restricted low fat diet on body weight and cardiovascular risk factors in healthy women. J. of clin. Endo. And Metabolism (2003), Vol. (88) 1617-1623.

13. Segal Isaacson C.J."Randomized trial comparing a very low fat and low carbohydrate diets matched for energy and protein" Obesity Research (2004), 12, P.No. 1305-1405.

14. Nordmann A. J., Nordmann A., M., Keller U., Bucher H.C., "Effect of low carbohydrate vs low fat diets on weight loss and cardiovascular risk factor: A meta analysis of randomized controlled trials" Archives of Internal Med. (2006), 166 (3) P.No. 285-293.

15. Dena M., B, Lisa Sanders, Jane H., Harian M. Krumholz, "Efficacy and safety of low carbohydrate diets" J. of Am. Med. Asso. JAMA, (2002), 289 (15) P.No. 1837-1850.

16. Samaha F.F., Seshadri P, Chicano K., Williams M., " A low carbohydrate as compared with a low fate diet in severe obesity", New England J. of Medicine (2003), 348 (21) P. No. 2074—2081