Alkaline-Ash Foods in the Dietary Management of Diabetes Mellitus

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ABSTRACT

The effect of diets based predominantly on alkaline ash foods was studied in 51 NIDDM subjects. This particular dietary regimen aimed not only at controlling hyperglycaemia in diabetics, but also managing associated disorders like obesity and hypertension by correcting the acid-base imbalance existing in the body. The study was conducted on 27 males and 24 females suffering from non-insulin dependent diabetes mellitus, as confirmed by their blood glucose analysis. Of the 51 subjects selected, 2 2had fasting blood glucose levels between 130-200 mg/dl and 29 had fasting blood glucose levels greater than 200 mg/dl prior to the study period. Dietary profile of the experimental group, including the details of dietary intake, food preferences and eating habits, was obtained. Fasting blood glucose (FBG) and post prandial blood glucose (PPBG) levels were estimated at the baseline and after the administration of the alkaline ash diet for a period of 4 weeks. Weight, blood pressure and state of constipation were also recorded before and after the study period. The efficacy of this dietary regimen in controlling the hyperglaycaemic state was established by using the '*t*' test for paired data.

INTRODUCTION

There is no disease which provokes greater thought on diet than diabetes mellitus and diet is considered the sheet anchor in the treatment of diabetes [1]. Balanced body chemistry is an essential factor in the maintainence of health. In normal health, the reacting of blood is alkaline and this is essential for our physical and mental well-being [2]. Diabetes is one of the many pathological conditions which is characterized by serious disturbances in the acid base balance [3]. Hence in diabetic subjects there is a decrease in blood pH and acid buffering capacity of blood. Since all foods after digestion and absorption leave either an acid or an alkaline ash in the body [2], every article in the diet tends to move the body chemically in some direction[4].

Hence it is of utmost importance that an appropriate ration between acid ash and alkaline ash foods be maintained in the diet to ensure good health. The optimum health depends on maintaining a slight preponderance of base over acids [5].

The present study was undertaken to evaluate the performance of predominantly alkaline ash food diets in terms of improvement in the diabetic state and overall health of a group of non-insulin dependent diabetic (NIDDs).

MATERIALS AND METHODS

Fifty-one NIDDM subjects in the age group of 23-81 years were selected for the study. Information was obtained from the subjects with regard to the following aspects:

Their usual dietary practices, as assessed by means of a 24 hour dietary recall taken prior to the study.

Their food preferences with regard to restriction of certain foods, consumption of non-vegetarian, refined and processed foods.

Data pertaining to practices like smoking, alcohol consumption and pan-masala/tobacco chewing.

Chronic complaints like constipation and indigestion.

The dosage of oral hypoglycaemic agents (OHA) and/or insulin being administered to the subjects for controlling their diabetes.

Biochemical parameters like fasting blood glucose (FBG) and post-pranidal blood glucose (PPBG) levels were obtained before and after the study.

Weight and blood pressure were recorded prior to and at the conclusion of the study.

A special dietary regimen, predominantly consisting of alkaline ash foods was prescribed to the subjects during the course of the study. This permitted the consumption of the following foods:

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All fruits (except prunes, cranberry and plums). All vegetables (steamed or slightly cooked). Curds and buttermilk. Nuts like almonds, cashewnuts, walnuts, apricots and oil seeds like peanuts.
A day's typical menu would be as follows:

Early morning	:	Herbal tea
Breakfast	:	3 exchanges of fruit
Midmorning	:	Coconut water with cream (malai)
Lunch	:	1 exchange cereal 1 exchange pulse 1 exchange vegetable 1 exchange curds salads minimum 150 gms
Midafternoon	:	Light tea (very little milk, no sugar)+ 5 almonds
Evening	:	Sprouts
Dinner	:	1 exchange cereal 1 exchange curds 1 exchange vegetables (roasted potato) salads, minimum 150 gms
After dinner	:	1 fruit

Total daily quota or oil 4 teaspoons per day and salt ¼ teaspoon per day.
The food exchange values in the above sample menu are in accordance with the recommended exchange list (1990) of the Indian Diabetic Association.
Although cereals like wheat, rice and pulses re acid ash producing foods, these were included in the diet (in unrefined forms) to ensure patient compliance and to increase the caloric density of the diet. However, the amounts prescribed were much lower than those in conventional diabetic diets.
Non-vegetarian foods, refined cereals and their products and milk were completely excluded from the diet.
Variations in the sample diet were made on the basis of individual caloric requirements and food preferences.
These prescribed diets were then analysed for various nutrients such as energy, carbohydrates, proteins, fat, some vitamins and minerals and the values obtained were then compared to those obtained from the nutrient analysis of the diets consumed by the subjects prior to the commencement of the study.

The subjects were advised to continue the same level of physical activity as in the pre-study period. They were also permitted to continue their prescribed medication during the course of the study.
The data was evaluated by using the 't' test for paired data.

RESULTS

Data obtained on the baseline dietary practices of the subjects reveled that 56/86% (29) of them were non-vegetarians and 43.14% (22) were vegetarians.
Only a small fraction of the group under study, that is 13.72% (7) reported daily consumption of fruits, vegetables and salads which are alkaline ash rich foods.
88.25% (45) of the individuals consumed cooked spicy, processed, refined and fried foods a daily basis.
Pan-masala/tobacco chewing and smoking was reported by 39.21% (20) of subjects.
Results of the analysis of diets consumed by subjects prior to and during the study period are presented in Table 1.
The alteration in blood glucose levels at the end of the study period are presented in Table 2.

TABLE – 2

FBG and PPBG before and after the study period

	Before study	After study	P
FBG ± SD (mg/dl)	239.95 ± 32.88	172.24 ± 31.53	<0.001
PPBG ± SD (mg/dl)	284.4 ± 66.59	172.66 ± 55.45	<0.001

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ii)Alteration in the dosage of OHA and insulin at the end of the study are presented in Table 3.

TABLE 3

Drug Therapy	% of subjects	Increase in dosage	Decrease in dosage	Nochange in dosage
OHA	80.39%	--	78.04%	21.95%
Insulin	19.60%	--	100%	--

iii) Changes in weight, blood pressure and state of constipation of the subjects after a period of 4 weeks are presented in Table 4.

TABLE 1
MEAN NUTRIENT INTAKE IN MALES

Nutrients	Mean Intake		Mean Intake/100 kcal	
	Previous diet	Prescribed diet	Previous diet	Prescribed diet
Energy (kcal)	2224.0	1234.0		
Cabohydrates (gms)	276.17 (56%)	167.33 (54%)	12.43	13.55
Protein (gms)	68.94 (12%)	40.84 (13%)	3.10	3.27
Fat (gms)	93.90 (38%)	45.25 (33%)	4.22	3.67
Dietary fibre	17.62	27.14	0.79	2.17
Saturated fat	23.72	10.57	1.07	0.86
PUFA (gm)	23.76	10.79	1.07	0.86
P/s ratio	1.0	1.02		
Ash (gm)	4.74	8.57	0.21	0.69
Sodium (mg)	2876.17	890.83	129.32	71.0
Potassium (mg)	1977.66	2890.83	88.99	231.27
Calcium (mg)	706.17	731.50	31.75	58.52
Phosphorus (mg)	1390.00	931.00	62.56	74.58
Iron (mg)	17.49	12.80	0.79	1.04
Chromium (mg)	0.05	0.10	0.002	0.008
Na/K ratio	1.45	0.31		
Vitamin A (IU)	7032.0	17122.0	316.45	1369.70
Vit D (IU)	110.0	12.0	4.95	0.98
Thiamine (mg)	1.72	1.25	0.08	0.10
Riboflavin (mg)	1.42	1.32	0.06	0.11
Niacin (mg)	18.27	9.20	0.82	0.74
Foliocin (mg)	223.91	500.0	10.07	40.0
Vit B^{12} (mg)	1.65	0.88	0.07	0.07
Vitamin C (mg)	50.18	259.33	2.26	20.75
Sugar (gm)	15.82	64.75	0.05	5.18
Caffeine (mg)	46.51	29.52	2.10	2.36
Cholesterol (mg)	108.87	30.56	4.90	2.44

TABLE 2
MEAN NUTRIENT INTAKE IN FEMALES

Nutrients	Mean Intake		Mean Intake/100 kcal	
	Previous diet	Prescribed diet	Previous diet	Prescribed diet
Energy (kcal)	1655.0	1058.0		
Cabohydrates (gms)	172.0 (42%)	127.33 (48%)	10.39	12.03
Protein (gms)	55.80 (14%)	34.44 (13%)	3.37	3.26
Fat (gms)	80.91 (44%)	45.85 (39%)	4.89	4.33
Dietary fibre	10.33	20.66	0.68	1.95
Saturated fat	23.12	11.13	1.40	1.05
PUFA (gm)	18.23	11.04	1.10	1.04
P/s ratio	0.79	0.99		
Ash (gm)	4.87	8.17	0.29	0.77
Sodium (mg)	4065.0	980.83	245.62	92.71
Potassium (mg)	1436.67	2564.67	86.81	242.41
Calcium (mg)	610.0	688.67	36.86	63.20
Phosphorus (mg)	832.33	657.67	50.29	62.16
Iron (mg)	10.1	9.89	0.61	0.93
Chromium (mg)	0.072	0.10	0.004	0.009
Na/K ratio	2.83	0.38		
Vitamin A (IU)	7245.0	16836.0	437.78	1591.27
Vit D (IU)	90.38	18.27	5.46	1.73
Thiamine (mg)	1.27	0.82	0.08	0.08
Riboflavin (mg)	1.51	1.21	0.09	0.11
Niacin (mg)	14.71	7.75	0.89	0.73
Folacin (mg)	152.67	353.17	9.22	33.38
Vit B^{12} (mg)	2.29	0.99	0.14	0.09
Vitamin C (mg)	23.61	189.0	1.43	17.86
Sugar (gm)	30.66	58.37	1.85	5.52
Caffeine (mg)	88.57	25.83	5.35	2.44
Cholesterol (mg)	131.74	35.12	7.96	3.32

TABLE 4

Complications	Total % of subjects	Increase	Decrease	No change
Weight				
a) Overweight	45.10%	--	91.30%	8.70%
b) Normal weight	54..90%	10.71%	17.86%	71.44%
Elevated Blood Pressure	43.14%	--	95.45%	4.55%
Constipation	45.10%	--	100%	

DISCUSSION

Nutrient analysis of diets consumed by subjects prior to the study period indicated that these diets were high in fat, low in fibre, vitamins and minerals. These diets were low in trace minerals like chromium, the deficiency of which has been implicated in the aetiology of NIDDM. These diets were found to be very high in acid-ash foods like meat, fish, eggs, cereals, tea and coffee.

Analysis of the recommended diets indicated a high intake of fibre, vitamins (especially ascorbid acid) and minerals. These diets were found to be essentially how in calories and fat and contained a high proportion of alkaline ash foods. The sodium content of these diets was found to be considerably low when compared to the previous dietary regimen. Also potassium content was observed to be high, while Na/K ratio was observed to be considerably low.

The prescribed diet was also found to have higher nutrient density especially with respect to fibre, vitamin and minerals. Though the diet was considerably low in calories, patient compliance was fund to be fairly good, probably because of high bulk and satiety value.

The prescribed diet was observed to have induced a favorable reduction in the blood glucose levels of the subjects at the end of the study and the differences were found to be statistically significant.

In the entire group of 51 subjects, mean reduction in FBG levels was found to be 32.29 mg% and mean reduction in PPBG levels was found to be 111.74 mg%.

On the prescribed diet, 39 subjects reported a decrease in their OHA dosage, from a total of 41, who were consuming OHA for better control of hyperglycaemia. Ten subjects were administering insulin prior to and during the study. On conclusion of the study, all the subjects were advised a reduction in their insulin dosage on account of decrease in blood glucose levels.

The prescribed dietary regimen also appeared to have exerted a beneficial effect on other parameters like weight, blood pressure and constipation. Most of the subjects reported a sense of well being and vitality after a four week study period on the alkaline ash diet.

CONCLUSION

The alkaline ash diet appeared to have induced favorable effects not only on the blood glucose levels but also on other disorders associated with the diabetic state. These desirable effects could have been brought about by many components of the diet such as dietary fibre, trace minerals vitamins and low calorific value. Hypocaloric content of an alkaline ash rich diet may be the principal cause of reduction in blood glucose levels. However the long term benefits of this diet in terms of physical and mental well being and establishing healthy eating habits are noteworthy. Although an acid-ash hypocaloric diet may also confer similar benefits, the high satiety value of an alkaline ash diet makes it more acceptable. The compliance rate was good with the alkaline ash diet over the 4 week study period.

Since this concept of 'ash' and its role in disease remains largely unexplored, it appears that more experimental and biochemical evidence would be required before alkaline ash regimens can be advocated with certainty for disease with acid-base imbalances.

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