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Effects of Barley Semolina on Physiological And Biochemical Parameters in Chronic Kidney Disease Patients

KEYWORDS: Barley semolina, nutritional status, renal functions

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ABSTRACT *Scanty data is available in the dietary use of barley in chronic kidney disease patients. Objectives: To study the effects of barley semolina on physiological and biochemical parameters in chronic kidney disease patientsMethods:Forty-nine patients of stage three chronic kidney disease were selected to evaluate the effects of barley semolina. Baseline patient's data including anthropometric measurements, hemograme, serum electrolytes, lipid profile and renal function were noted. All participants were then advised to consume barley in their daily breakfast at 10% of daily calorie requirement for one month and 20% in the second month. At the end of both first and second month the participants were evaluated for change in baseline data.Results: A significant improvement in the nutritional status was observed at both 10% and 20% of nutritional intervention with barley. The total cholesterol and triglycerides were reduced ($p<0.001$) and HDL cholesterol increased with both interventions. Sodium was significantly increased ($p<0.001$) with the 20% intervention only. Potassium decreased with both the interventions ($p<0.001$). Hemoglobin values were improved at 10% and 20% intervention levels. Conclusion: Introduction of barley in the diet of stage 3 chronic kidney disease patients has significantly improved the nutritional status and renal functions. Lowered total cholesterol, triglycerides and increased HDL cholesterol were also found. This is a hypothesis generating study and further work needs to be done in this area on a large scale.*

INTRODUCTION

The role of nutritional support in kidney disease is to prevent or reserve associated malnourished status, minimize the adverse effects of substances that are inadequately excreted and favorably affect the progressions and outcome of kidney disease. Careful dietary management may make it possible to stabilize the progression of chronic kidney disease and avoid or postpone dialysis[1]. Conservative management of chronic kidney disease (CKD) has included variety of dietary manipulations and supplementation of dietary fiber to reduce adverse symptoms is a novel approach[2].

Barley is one of the cereal grains and is a staple food in most countries of Middle East. In other western countries it is grown for animal feed and for malt extract. Barley in India is used as human food and barley flour is by and large mixed with wheat or gram flour for preparing chapattis and also in making bread[3]. Barley is source of dietary fiber, b-glucon and antioxidents[4].Barley is a good diuretic among cereals, barley water made after cooking cereal is very beneficial in all urinary and kidney disease conditions. It is rich in amino acid L-tryptophan, vitamin E, minerals such as calcium, copper, Iodine, magnesium and potassium[3].

Barley intake has been shown to have beneficial effects on lipid metabolism. Clinical data continue to demonstrate that the consumption of barley products is effective in lowering total and LDL-cholesterol[4,5]. Chronic kidney disease patients are advised low sodium diet to avoid volume over loads and hemodynamic instability and low potassium diet to avoid the potential complications of hyperkalemia. The chromium content of barley has shown to improve glucose tolerance in glucose intolerant people and could be of benefit in dietary management of diabetes mellitus[5].Limited studies are available on the effects of barley on chronic kidney disease. In view of this, the present study was undertaken to study the health benefits of barley cereal in chronic kidney disease.

Objectives

To study the effects of barley semolina on nutritional status, lipid profile and kidney functions in patients with chronic kidney disease.

MATERIALS AND METHODS

The study was conducted in RL Jalappa Hospital and research Centre, Kolar, Karnataka. A total of 92 patients fitting into the selection criteria (CKD stage 3, MDRD calculation) attending medicine outpatient department from June 2009 to July 2010 were enrolled. Informed consent was obtained from the patients willing to participate in the study. Anthropometric measurements have been used as a marker of nutritional status and body composition. Measurements like body weight, height, skin fold thickness and mid arm muscle circumference were recorded. Body mass index calculated and also biochemical tests conducted as per standard lab procedure and recorded.

Cleaned and conditioned barley is milled to make semolina. In the beginning of the study Uppuma and porridge prepared of barley was given to ten patients to test the acceptability in terms of appearance, texture, taste, color and flavor[6]. The recorded scores were within acceptable range. Patients and their attendants were demonstrated the use of semolina in preparing Uppuma and porridge for the breakfast. For each patient the daily calorie requirement was calculated. 10% of it was substituted with barley to be consumed as breakfast. Patient wise daily pouches of 10% barley semolina was calculated and distributed for one month. The patients were followed up weekly enquiring about their barley consumption through telephone contact. At the end of the one month, anthropometric measurements and biochemical tests were performed and findings recorded. Barley consumption was

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increased to 20% of the daily calorie requirements for the second month and similar follow up was done. Out of 92 patients enrolled for the study 49 patients completed the two months follow-up. Other 43 patients were dropped out in between due to their noncompliance in follow-up.At both the clinic visits, demography data, personal history, physical activity and medications used were determined with a standard questioner. Medications were validated by examination of prescriptions or pills brought to the physician.

The data obtained was analyzed using SPSS software version16, change variables were defined as follow-up values minus baseline values. Specific mean differences between follow-up and baseline visits were employed by paired t-test to test the significant difference between the samples.

RESULTS

Forty-nine chronic kidney disease patients participated in the study, 21(42.85%) male and 28(57.15%) were female (fig.1). Introduction of barley cereal in the diet of stage3 CKD patients improved the kidney function, the mean values of serum urea, creatinine and uric acid were not significant both at 10% and 20% of barley intervention (table 1). Total cholesterol and triglycerides were reduced significantly (P< 0.001) both at 10% and 20% barley intervention. At the same time HDL cholesterol increased at 10% and 20% barley intervention (p<0.001). No change of sodium at 10% intervention but at 20% intervention it was increased. Potassium decreased at both 10% and 20% intervention table 2. Significant increase in nutritional status were observed in weight, MAMC and body mass index at 10% and 20% intervention , but there was no improvement in SFT at 10% intervention, slight difference were observed at 20% intervention (table 3&4).While total protein, albumin and hemoglobin were not significant both at 10% and 20% barley intervention (table1&2).

DISCUSSION

There is an improvement in the nutritional status of the patients in the study as the body weight and BMI were elevated significantly at 10% and 20% of dietary intervention. Whereas serum albumin, total protein and hemoglobin levels were not significant at 10% and 20% of dietary intervention. A study from National Health and Nutritional Examination Survey (NHANES) revealed CKD patients with improved nutritional status have better survival rate[7]Most people with diabetes and CKD require sodium restriction in diet to have optimum blood pressure control and to prevent fluid retention[8]. In the present study no change in sodium levels was observed at 10% barley diet intervention, while at 20% intervention it was raised.Diuretic property of the barley may be the reason for improvement in the kidney function in the study[9]. In this regard, there is a need to optimize renal bone disease management through prescription of phosphate binding medications and vitamin D derivatives[10].

The present study showed a statistical significant (p<0.001) decrease serum cholesterol and triglycerides and at the same time a statistically significant (p<0.001) increased HDL levels. Lupton JR et al concluded that addition of barley bran flour or barley oil enhances the cholesterol lowering effect[11]. The ability of barley B-glucan soluble fiber to lower serum cholesterol is a combination of factors and mechanisms. Suggested mechanisms of cholesterol reduction include, delayed intestinal absorption of glucose and lipids and inhibition of absorption and reabsorption of cholesterol and bile acids accompanied by increased excretion of bile acids[12,13,14].The reduced absorption may be caused by the high viscosity of b-glucon solutions, which increases the viscosity of the intestinal contents[15.16,17]. Other factors may also be important, such as the fermentation of b-glucan in the colon, resulting in production of short-chain fatty acids, which impede cholesterol biosynthesis[13].

CONCLUSION

The effects of barley semolina in the diet of stage 3 CKD patients had significant difference for total cholesterol, triglycerides and HDL-c. At the same timesignificant differencewas observed for nutritional status. However, further research in this field needs to be accompanied in CKD patients, to substantiate the health benefits of barley.

Table.1 Mean values of biochemical parameters at 10% barley intervention

Parameters	Base line Mean ± SD	10% invention Mean ± SD	p-value
Urea(mg/dl)	60.35±12.72	56.12±1.45	0.001*
Creatinine(mg/dl)	4.26±1.21	3.68±1.05	0.001*
Uric acid(mg/dl)	4.87±1.06	4.34±0.86	0.437
Total protein(g)	5.47±0.93	5.97±0.95	0.543
Albumin(g)	4.19±0.74	4.73±87	0.001*
Hemoglobin(g)	10.9±2.02	11.15±2.05	0.655
Cholesterol(mg/dl)	204.33±35.57	196.02±32.7	0.001*
Triglycerides(mg/dl)	190.35±65.96	182.65±59.61	0.001*
HDL-c (mg/dl)	33.39±5.26	34.06±4.84	0.001*
Sodium(mEq/l)	141.43±13.92	141.43±13.92	0.234
Potassium(mEq/l)	5.28±0.85	4.85±0.71	0.001*

***P<0.001 considered as significant**

Table.2 Mean values of biochemical parameters at 20% barley intervention

Parameters	Baseline Mean ± SD	10% invention Mean ± SD	p-value
Urea(mg/dl)	60.35±12.72	54.9±12.82	0.001*
Creatinine(mg/dl)	4.26±1.21	2.06±0.69	0.001*
Uric acid(mg/dl)	4.87±1.06	3.37±0.8	0.243
Total protein(g)	5.47±0.93	7.39±0.62	0.453
Albumin(g)	4.19±0.74	5.11±0.7	0.001*
Hemoglobin(g)	10.9±2.02	21.33±1.92	0.876
Cholesterol(mg/dl)	204.33±35.57	190.53±20.77	0.001*
Triglycerides(mg/dl)	190.35±65.96	187.59±154.59	0.001*
HDL-c(mg/dl)	33.39±5.26	35.04±4.33	0.001*
Sodium(mEq/l)	141.43±13.92	147.55±11.03	0.457
Potassium(mEq/l)	5.28±0.85	4.05±0.53	0.001*

***P<0.001 considered as significant**

Table 3. Mean values of nutritional status at 10% barley intervention

Parameters	Baseline Mean±SD	10% intervention Mean±SD	p-value
Weight(kg)	60.57±10.31	61.57±10.09	0.001*
Height(cm)	162.92±8.08	162.92±8.08	0.231
SFT(mm)	16.94±2.96	16.94±2.96	0.061
MAMC(cm)	19.22±2.66	19.44±2.66	0.072
BMI(kg/m^2)	22.72±2.84	23.11±2.73	0.001*

***P<0.001 considered as significant**

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Table 4. Mean values of nutritional status at 20% barley intervention

Parameters	Baseline Mean±SD	20% intervention Mean±SD	p-value
Weight(kg)	60.57±10.31	62.47±8.97	0.001*
Height(cm)	162.92±8.08	162.92±8.08	0.543
SFT(mm)	16.94±2.96	18.25±2.89	0.001*
MAMC(cm)	19.22±2.66	20.55±2.46	0.345
BMI(kg/m^2)	22.72±2.84	23.45±2.17	0.001*

***P<0.001 considered as significant**

Figure.1 Age and sex wise distribution of study subjects

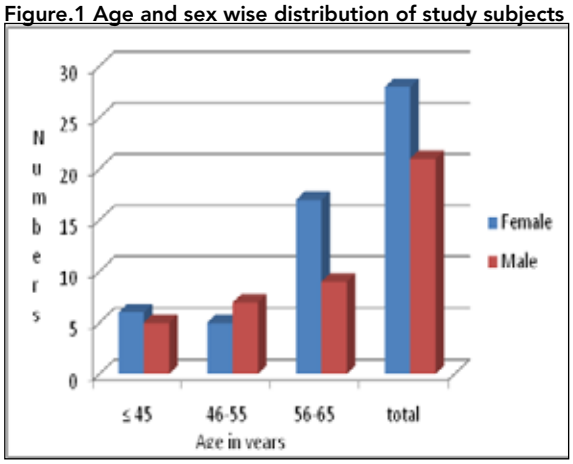


Figure.2 Mean values of biochemical parameters at 10% and 20% barley intervention

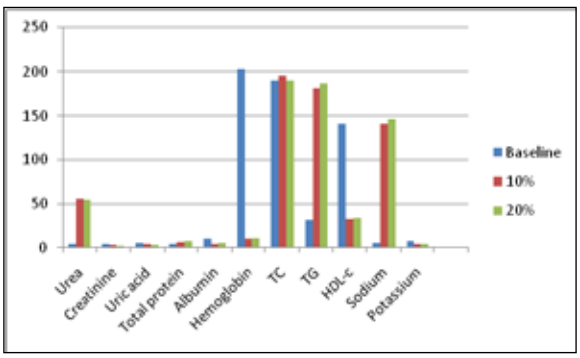
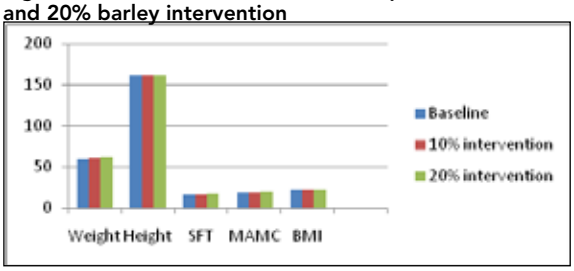


Fig. 3 Mean values of nutritional status parameters at 10% and 20% barley intervention



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