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Research Note

Effect of Nutrition Education Intervention to Diabetic Subjects on use of Millet Recipes in the Management of Diabetes

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ABSTRACT

Diabetes mellitus is the most common metabolic disorder affecting humankind and creating health hazard. The inclusion of millets in the diabetic diet has been reported from ancient days in India as they exhibit hypoglycaemic effect due to presence of higher proportion of complex carbohydrate, resistant starch, slow rising sugars and water-soluble gum β-glucans. With this context the study was conducted in which the knowledge, attitude and practice of millets of the diabetic subjects were seen and further the intervention programme on consumption of millet recipes for 30 days was conducted on 12 diabetic volunteers. The nutrition education enhanced the level of adoption of millets by12.9 per cent. Significant reduction in Fasting and Post Prandial Blood sugar level and reduction in diabetic symptoms were also observed. Millet recipes along with the recommendation for diabetics can also be introduced in the regular diet of normal healthy people which in return may help to increase the food value chain of millets.

Keywords: Adoption, Attitude, Intervention, Knowledge, Millets, Nutritional awareness, Practice

INTRODUCTION

Diabetes poses a major health problem globally and is one of the top five leading causes of death in most developed countries. The prevalence of diabetes in India is showing a sharp upswing as is evident from secular trends from different parts of the subcontinent and studies of migrant Indians (Mohan, 2004). India is called the capital of diabetes. Recent studies in India have established strong positive associations between refined grain intake and Type 2 diabetes. Moreover, improved standard of living has modified the lifestyle of people leading to health and nutritional transitions thus inviting the spectrum of lifestyle disorders**.** Healthy traditional recipes having coarse grains and conventional cooking methods are replaced by recipes of refined grains predominantly wheat and rice (Nambiar and Patwardhan, 2014**)**. Diet, exercise and drugs management are very much essential for a diabetic patient. But diabetes management is sometimes very costly for the poor man as they cannot afford to the drugs and also regular check up. Hence, especially for them diabetes management through diet is very much essential. Emphasis need to be given more on carbohydrates in all the three meals and also the intake of dietary fibre content.

Millet is a general category for several species of small grained cereal crops and is a food staple in parts of India, Africa, China and elsewhere. Millet contains an average of 10–12 per cent protein and is superior to that of wheat or corn in terms of content of essential amino acids, it nonetheless contain less than half the amount of the essential amino acid lysine that is found in high quality protein sources such as meat (Ronzio, 2004). Moreover, millets are rich in the phytochemicals like polyphenols and antioxidants which are helpful in delaying the onset

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of secondary complications of diabetes. But still most of the people are unaware about the nutritional and therapeutic properties of millets. People are only consuming rice and wheat in their staple diet. In this context an awareness programme was conducted for giving proper nutrition education to the diabetic subjects on the role of millets in the management of diabetes An intervention programme on millets was also conducted and also the adoption of millets in regular diet was studied.

METHODOLOGY

The subjects were selected through simple purposive random sampling method. Different institutes of Dharwad - Hubli area were visited for selection of subjects for giving nutritional awareness. Interested centres were selected for nutritional awareness programme. The centres included 2 hospitals- Dr. S.R. Ramanagoudar hospital and Chetana Diabetic Centre, one factory- Valtek Corporation, Navanagar, Hubli and UAS, Dharwad campus. From each institute 5 to 15 diabetic subjects were selected. Information regarding age, sex, onset of diabetes of the selected respondents was collected. Keeping in view the objective of the study the questionnaire was developed and pretested to assess the nutritional knowledge, attitude and practice of millets by the diabetic subjects. It included 3 sections in which 20 knowledge related, 13 attitude related and 7 practices related questions were included. 50 diabetic volunteers were selected from 82 diabetic subjects and data was collected through pre structured interview schedule. Collected data was analysed using mean and standard deviation.

Nutrition education was given in four different sessions for 1 hour each to 82 subjects of different institutions. Lecture was given regarding the nutritional and therapeutic properties of millets especially with respect to diabetes. Education materials in the form of handouts containing information on diabetic foods, dietary fibre, diabetic complications and their management through millets were also provided to the diabetic subjects. The patients were provided folders containing information on the recipes along with the procedure to cook the recipes in detail. The diabetic patients were given 10-20 grams of each recipe in cups and there were 10 breakfast/ lunch items and 4 snacks items so that their acceptability could be seen. The sheets were provided which included 5 point hedonic scale containing excellent, very good, good, fair and poor.

Out of 82 diabetic subjects, 12 diabetic volunteers were selected who were ready for consumption of different millet recipes for 1 month. Easy to cook and traditional recipes were provided to the diabetic subjects. Eight packets containing 100g of millet raw ingredients for different recipes like little millet upma, foxtail millet upma, ragi vermicelli, foxtail millet bisibelebhat, foxtail millet khichdi, ragi dosa, ragi thalipattu, little millet rice were provided once in a week continuously in cyclic menu. The secondary data of the initial blood parameters like Fasting blood sugar and Post Prandial Blood Sugar of the diabetic subjects were collected before the study and after the intervention to see the changes in their blood sugar profile. The changes in number of initial and final diabetic symptoms were also observed. For the follow up of the level of adoption a channel of supply was created for the diabetic subjects. Raw millets and also ready to use millet recipes mixes were supplied in UAS campus and also in the hospitals on payment basis. A stall was put in UAS campus once in a week for three months and also made available in College of Rural Home Science, Dharwad. Addresses of shops where millets were available locally were also facilitated. Regular update was kept regarding their consumption of millets over phone and level of adoption was studied.

The knowledge, attitude, practice level, change in symptoms and the level of adoption were expressed in frequency and percentage. Paired t-test was used for the comparison of initial and final blood sugar level.

RESULTS AND DISCUSSION

The nutritional knowledge level of fifty diabetic subjects about millets showed that about 38 per cent of the subjects had high knowledge about the therapeutic qualities of millets. Majority of the respondents had moderate knowledge (40%) (Figure 1). Very few people, about 22 per cent of the subjects were unaware about the millets. This data shows high nutritional knowledge of people about millets. Similar results were reported by

Malagi *et al*. (2007) in which equal number of diabetics belonged to good and poor knowledge categories, showing the need for education programme to improve the knowledge about diabetes. Majority of the population had moderate knowledge scores (36.70%) followed by low (32.10%) and high knowledge scores (31.20%). This may be due to the wide growing area of millets in the local region. Similar results reported by Beranje *et al*. (2010). They were aware of it as millets are consumed as festival foods in North Karnataka. Also they knew about millets in general by getting the idea from their ancestors. But the knowledge was limited to the general benefits of millets only. But they were unaware about the nutritional and therapeutic qualities of millets. As per the survey, about 32 per cent of the people had highly favourable attitude (Figure 2), thirty per cent of the subjects had favourable attitude towards millets, but more diabetic subjects had 'less favourable' attitude (38%) towards millets despite their good knowledge and were not ready to accept millets. This may be because some people thought that millets were not easily digestible, content of anti-nutrients in them, hence they may cause harmful effects on health like diarrhoea and other ailments. The main reasons was that millets are considered as poor man's food, people thought that if they consume millets then it would hamper their status. About 24 per cent people had good practice of millets in their regular diet either in breakfast, lunch or dinner about 3 to 4 times in a week or daily. About 50 per cent of the people had satisfactory practice of millets. About 26 per cent of the subjects did not consume millets at all (Figure 3). Majority of diabetic subjects (66%) had satisfactory practices. Malagi *et al*. (2007) and Beranje *et al*. (2010) reported that 41.30 per cent of diabetic subjects had satisfactory practice scores regarding consumption of whole grains in the management of diabetes. Practice was only limited

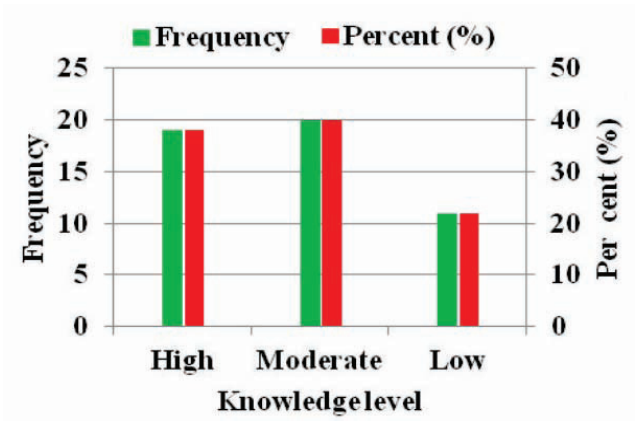

Figure 1: Nutritional knowledge of diabetic subjects about millets

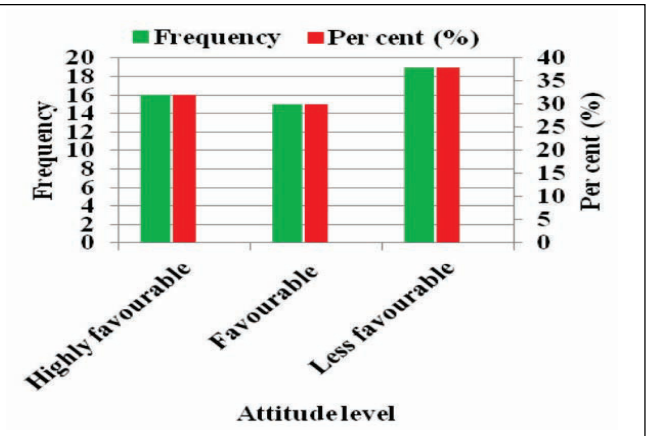

Figure 2: Attitude level of diabetic subjects towards millets

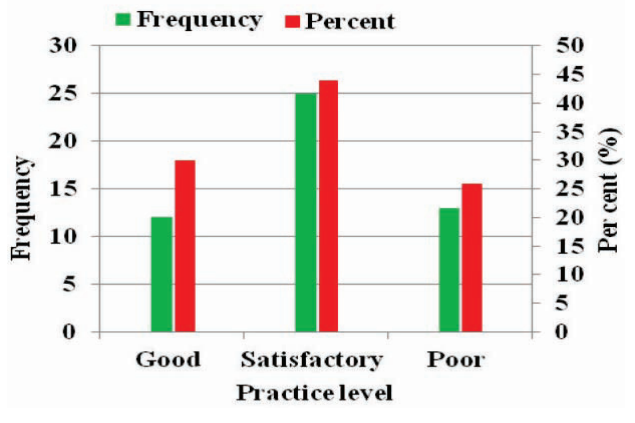

Figure 3: Overall food practice of diabetes subjects

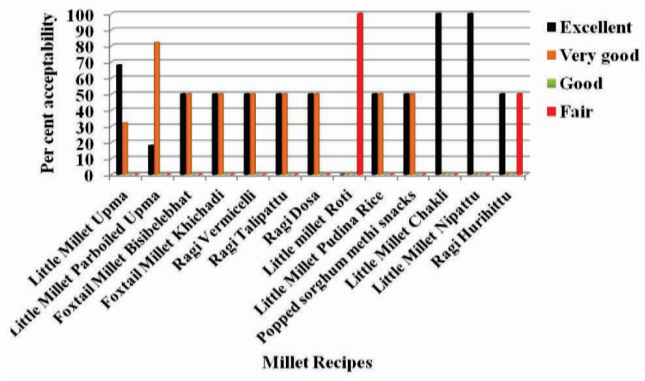

Figure 4: Per cent acceptability of millet recipes by diabetic subjects

to functions and festivals. Despite good knowledge about millets also they were not ready to consume millets as there was lack of availability and also they were unaware about different types of millet recipes. So they couldn't cook and eat. Another reason may be, through various schemes and programmes, government is supplying refined cereals to people at very cheaper price and the Below Poverty Line (BPL) people were also entertained with so many facilities to get proper nutrition. They were being provided with cereals and pulses at a reasonable price. So, they were not opting for millets.

All the recipes were highly acceptable and were categorized as 'excellent' and 'very good', mainly little millet upma. Only little millet *roti* was scored as 'fair' (Figure 4). Among the snacks items little millet *chakli* and little millet *nipattu* were highly acceptable (100%). Popped sorghum *methi* snacks and *ragi hurihittu* were 50 per cent acceptable as 'excellent' (Figure 4). Evaluation of dhokla, uppuma and laddu for preference using a nine-point hedonic scale showed all the three food products to be acceptable, Similar results reported by Pathak *et al*. (2000). In a study by Yenagi *et al*. (2011), foxtail millet steamed *methi kadabu* was highly accepted, followed by little millet steamed *kotte kadabu* and little millet vegetable pulav. The most acceptable among the breakfast items were little millet *upma* followed by little millet parboiled *upma*. It may be attributed to their good taste or mineral content. Among the snacks items, little millet chakli and nipattu were highly acceptable. It may be due to their appearance, taste, crispiness and familiarity. The breakfast cereal developed by Kumari *et al*. (2019) with pearl millet was also found nutritionally superior.

The initial range of the Fasting Blood Sugar (FBS) was 95 to 188 mg/dl and in Post Prandial Blood Sugar (PPBS) was 131 to 306.1 mg/dl. After intervention of millet based recipes there was significant ($p<0.05$) reduction of the Fasting Blood sugar as well as Post prandial blood sugar by 18.26 and 11.28 per cent respectively (Table 1). This can be attributed to the polyphenol content, antioxidant activity, anti-diabetic effect and also dietary fibre content of the millet recipes as compared to rice (Mishra, 2016). Similar results were also obtained after consumption of millet based recipes in several studies (Itagi *et al*., 2013; Jali *et al*., 2012; Yenagi *et al*., 2016). In some subjects there was rise in blood sugar after intervention either in Fasting or Post Prandial blood sugar level or even both. This may be because of consumption of other high glycaemic foods by them along with the millet recipes as the intervention

Table 1: Impact of regular consumption (30 days) of different types of millet foods on blood sugar level of diabetic subjects

S.No.	Age (yrs)	Sex	Onset (yrs)	Fasting Blood Sugar				Post prandial Blood Sugar			
				Initial (mg/dl)	Final (mg/dl)	Percent change (%)		Initial (mg/dl)	Final (mg/dl)	Percent change (%)	
1	53	M	3	140	97	30.71		170	156	8.23	
2	68	F	5	140	148	-5.71		200	248	-24	
3	57	F	8	170	161	5.29		190	172	9.47	
4	51	M	10	180	168	6.66		306.1	263.4	13.94	
5	3	F	4	165	135	18.18	**t = 3.198***	210	229	-9.04	**t = 1.467***
6	48	M	3	145.3	146.7	-0.96		260.8	220.9	15.30	
7	58	M	7	95	103	-8.42		210	195	7.14	
8	46	M	1.5	142	103	27.46		183	159	13.11	
9	49	M	3	188	158	15.95		221	212	4.07	
10	68	M	2-3 m	149.4	90.7	39.02		202	176.4	12.67	
11	43	F	3-4m	180	162	10.00		210	173	17.61	
12	45	F	1	99	88	11.11		131	150	-14.50	

was self motivated. Other reasons may be immediately after the intervention they didn't check the blood sugar. The symptoms like excess thirst, excess hunger, frequent urination, tingling, itching, blurred vision, weakness, nerve disorder, constipation, giddiness, numbness and irritability were found in the diabetic subjects before the millet interventions. Most of the subjects were having excess hunger (66.66%) followed by excess thirst (58.33%) and weakness (25%). After intervention of millet there was significant reduction in all the symptoms especially excess thirst (8.33%) and excess hunger (0%). This may be due to reduction in FBS and PPBS. The reduction could be due to the good nutrient composition, presence of phenolics, % DPPH radical scavenging activity, anti-diabetic effect and also dietary fibre content of these millet recipes (Mishra, 2016). Highly significant difference was present in the pattern of consumption of millets in regular diet. The subjects not consuming millets were significantly higher (63.41%) than people consuming millets. About 24.39 per cent of the people were consuming millets once in a week followed by regular consumption in one meal (10.98%). But only 1.22 per cent of the people were consuming millets regularly in all the meals. So, the total consumption of millets was found to be 36.9 per cent. Hence, the consumption of millets increased by about 12.9 per cent. A similar study revealed that nutritional knowledge among school children significantly increased (t value - 8.39**) at the end of awareness programme (Yenagi *et al*., 2012). This could be attributed to proper nutrition education and also likeness of the millets recipes which were not less than rice and wheat recipes in any of the sensory attributes. The reduction in blood sugar and also the reduction in the diabetic symptoms during the intervention programme may also have tempted them to consume millets in their regular diet. The reasons for non-consumption of millets by some of the diabetic subjects as depicted by them were because of the high cost, non availability, not possible for daily consumption and no time to cook separately.

CONCLUSION

The nutrition awareness programme on millets to diabetic subjects increased the level of adoption of millets in the regular diet by 12.9 per cent. Consumption of millet recipes for a period of 30 days significantly reduced the blood sugar level and also the diabetic symptoms. Hence, there is a need to promote consumption of millets and also to increase the availability through Public Distribution System. This information may be used in planning of diets by dieticians and nutrition graduates. Millet recipes may be introduced in the regular diet of families which will help to increase the food value chain of millets.

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