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Millets in Diabetes - Emic Views

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ABSTRACT

Background: With rising trend in diabetes and non communicable diseases and changing diet and lifestyles, it is important to understand food anthropology especially the “EMIC” views – perceptions of the subjects regarding the medical nutritional therapy, especially the use of fiber and antioxidant rich millet in their diets and the factors which prevent them from their use.

Aim: The present study was a cross sectional study on the profile of Diabetics focusing on the “EMIC” views on knowledge, perceptions and use of millets.

Methods and material: Free living confirmed diabetics were enrolled from two diabetic clinics of Pune, Maharashtra after necessary permissions and consent. Baseline data on the background information on the diabetic subjects and data on food anthropology focusing on “EMIC” views on millets were elicited using a semi structured questionnaire.

Results: The results revealed that out of the total 111 subjects, 69 % had diabetes only and 31% had diabetes and hyperlipidaemia both. Family history was seen in 77% of the total subjects. Stress before the onset of NCD was prominently reported by 73% men. Prevalence of disease condition was more among sedentary workers (66%), though the difference was not significant. The subjects had poor knowledge about various millets of India except pearl millet (bajra) and sorghum (jowar) and their role as MNT for diabetics as well as their glycemic index information. Millet consumption was found to be independent of all SES parameters and their place of residence (millet producing area) or availability of millets.

Conclusion: The study reveals that diabetics are not able to follow the regime of usage of millets though are aware of its health benefits. There is a need to propagate traditional easily acceptable millet based recipes among them as a part of their MNT.

Key words: food anthropology, Emic views, Diabetics, Millet consumption patterns.

INTRODUCTION

Despite normal weight, Asian Indians are at higher risk for type 2 diabetes and other metabolic abnormalities^{2,4,13,21,10}. The modern Asian Indian diet is particularly high in refined carbohydrates and low in protein, when compared to other dietary traditions^{12,17}. Recent studies in India have established strong positive associations between refined grain intake and Type 2 diabetes, and confirm the protective effect of fibre, which is contained in whole grains¹⁸.

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. Observational studies have shown that whole grains^{26,7,19,27} are associated with weight loss, reduced insulin resistance and type 2 diabetes. Carbohydrates are integral to Asian Indian dietary traditions and re-introduction of culturally acceptable, traditional, carbohydrate-rich grains with high nutrient density may be a prudent step in reducing disease burden in this population.

Refined carbohydrates, such as white rice and white flour, are the mainstay of the modern Asian Indian diet, and may contribute to the rising incidence of type 2 diabetes and cardiovascular disease in this population⁹.

The **MEDICAL NUTRITION THERAPY (MNT) FOR NCDS** highlights that foods containing high fibre such as cereals and millets (wheat, rice, bajra, jowar etc.), fruits and vegetables should be consumed regularly. Foods high in fat (fried foods, junk foods), refined sugars should be avoided. Consumption of excess salt should be discouraged. It also recommends a minimum of 6 servings of grain foods to be eaten daily, with at least 3 of those servings as whole grains⁶. The latest guidelines by NIN, 2010 recommend adequate consumption of cereals including millets and pulses, liberal intake of fruits and vegetables and sparing consumption of fast foods.

However, in food anthropological terms, the MNT is the *Etic Perspective* “*Outsider Perspective*”. These concepts of MNT for diabetes and NCDs may be meaningless to members of the culture. As social, ecological, physiological and cognitive processes influence choices among foods that cumulate in dietary intake²⁸. Food choice depends not only on nutrition and health considerations but also on factors such as local availability, cultural acceptability and individual likes and needs. There is no one measure which can be used to guide food choices in all cases¹¹.

In order to understand the food choices and intake, it is important to understand the The “*Emic*” *views or the “Insider Perspective”* of the diabetics regarding the use of cereals with a focus on millets. This perspective will enable us to understand the culture the way the diabetics understand it, to learn the concepts they use and to try to see the world the way they do. Thus, in order to apply comparative concepts appropriately, it is usually necessary to do research first from an emic perspective. *Emic* and *Etic* are endpoints of a continuum, rather than complete opposites (<http://pd.scisdragons.net>).

“*Emic and Etic*” are terms used by anthropologists and by others in the social and behavioural sciences to refer to two kinds of data concerning human behaviour. In particular, they are used in cultural anthropology to refer to kinds of fieldwork done and viewpoints obtained.

The purpose of this study was to assess the dietary patterns, morbidity profile, socio-economic status, dietary pattern, nutritional status, lifestyle pattern of the patients suffering from type 2 diabetes mellitus and hyperlipidaemia, such as consumption of fruits and vegetables, functional foods for NCDs, whole grain cereals with a focus on the *emic* views (perceptions, awareness and knowledge) regarding millets such as *jowar, bajra, ragi and kodri* as major cereals in their diets.

METHODS AND MATERIALS

Ethics approval

The study was initiated after acquiring the approval by the Medical Ethics committee of the Department of Foods and Nutrition, The M S University of Baroda and approval from the selected diabetes clinic in Pune. Informed written consent was obtained from the subjects enrolled for the study.

Sampling and Study site

Cross sectional study, wherein two low cost diabetic clinic of Pune city, Maharashtra, (Western India) were purposively selected. In depth study was conducted based on consent on 111 diabetics (40-80 y). The inclusion criteria:

- Only patients who were confirmed as type 2 diabetics (stable, controlled) or hyperlipidemics (TC >200mg, TG >150 mg/dl) by the physician were enrolled
- Patients who were Maharashtrians and residents of Pune only were selected
- May or may not have any other disease complications
- Willing to be a part of the study

Background information

Information regarding age, gender, caste, marital status, occupation, income, activity pattern, family history of NCDs, disease profile was collected.

Morbidity profile

The morbidity profile of the patients was assessed using a pre-tested semi-structured questionnaire which included questions regarding presence of various NCDs, family history, age of onset of disease, presence of stress before onset of the disease.

Dietary pattern

Dietary pattern of the patients before and after the onset of disease was assessed using a food frequency questionnaire (FFQ).

Lifestyle parameters

Habits such as alcohol, tobacco, physical activity and data on millet consumption, recipes, its health benefits, consultation with a dietician were computed using a structured questionnaire.

“Emic” perspective (knowledge, attitude and practices) regarding use of millets by diabetics

The subjects were asked about their knowledge on the types of millets consumed, recipes commonly prepared in Maharashtra, beverages prepared from millets, nutrients in millets and health benefits of millets. Reasons for consuming or not consuming millets were elicited. Information on the types of recipes prepared in their household was obtained.

Biochemical parameters

Secondary data on parameters such as Fasting Blood Sugar (FBS), Post- Prandial Blood Sugar (PPBS), Total Cholesterol (TC), Triglycerides (TG), Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL), Very Low Density Lipoprotein (VLDL) and Blood Pressure (BP) were obtained from the patient's records.

RESULTS

The background information revealed that out of 111 subjects (52 males and 59 females), 69% had only diabetes, 10% were having diabetes and heart disease, 57% had diabetes and blood pressure and 30.6% had diabetes and hyperlipidaemia (Table 1). However no significant difference in occurrence of disease among men and women was reported.

Table 1: Morbidity profile of the enrolled subjects

Assessment Parameters	Total % (n)	Males (n=52), % (n)	Females (n=59), % (n)	Chi-Square
Diabetes Mellitus	69 (77)	46.7 (36)	53.2 (41)	0.01 ^{NS}
DM and Heart Disease	10 (11)	63.6 (7)	36(4)	1.27 ^{NS}
DM and Blood Pressure	57 (63)	49 (31)	51 (32)	0.32 ^{NS}
DM and Hyperlipidaemia	30.6 (34)	30.76 (16)	30.50 (18)	0.01 ^{NS}

**Note: The subjects had existing co-morbidities, therefore the sum value exceeds total “n” due to overlapping. Significance tested at CI=95%, NS=Non Significant*

Considering the data, further relations were seen among diabetics and individuals with co-morbidity of hyperlipidaemia along with diabetes. The age of onset of the two diseases were compared between males and females. Majority of subjects (41%) were more than 50 years among whom 67% had onset of Diabetes Mellitus and 34% had both DM and Hyperlipidaemia. This trend was observed more among women (61%) than men 39%. However in the other two categories of age range (30-39 and 40-49), percent of males having onset of Diabetes Mellitus was higher.

Thus it could be stated that males are prone to onset of NCD at a younger age, hence prevention through dietary and lifestyle measures could prove to be a sustainable strategy. However, statistically significant difference was not observed on the age of onset of type of diseases among males and females.

Another important factor affecting the onset of a diseased condition is stress. So efforts were made to find out the relation between stress and onset of diseases among males and females. As much as 68% subjects, majority of which were males (73%) reported to be suffering from stress before any diseased condition was evident. Effect of stress on the type of disease did not have any significant difference. Moreover subjects who reported of not having stress before onset of disease also exhibited similar trend. The factors affecting the onset of disease have been illustrated in Table 2

Table 2: Factors affecting the onset of diseases among males and females

	Total	Specific Disease		Gender	
		DM	DM+Hyperlipidaemia	Male	Female
Age Range					
20-29 years	1.8 (2)	50 (1)	50 (1)	0	100 (2)
30-39 years	21.6 (24)	83.3 (20)	16.7 (4)	54.2 (13)	45.8 (11)
40-49 years	35.1 (39)	64.1 (25)	35.9 (14)	53.8 (21)	46.2 (18)
50 and above	41.4 (46)	67.4 (31)	32.6 (15)	39.1 (18)	60.9 (28)
Chi-Square Test		3.14 ^{NS}		4.14 ^{NS}	
Stress Before Onset					
Yes	67.5 (75)	68.8 (53)	64.7 (22)	73 (38)	62.7 (37)
No	32.4 (36)	31.2 (24)	35.3 (12)	26.9 (14)	37.3 (22)
Chi-Square Test		0.18 ^{NS}		1.35 ^{NS}	

*Significance tested at CI=95%, NS=Non Significant

Family history of one or more of the NCDs (Diabetes, Hypertension, CVDs or Obesity) was seen in majority (76.6%) of the subjects. Of these, 71.76% diabetics reported a family history as compared to 28.24% diabetic + hyperlipidaemic (DM+HL) patients. There is no statistically significant difference between the incidences of NCDs with regard to its family history (Table 3).

Table 3: Relation between family history of NCDs and current occurrence of NCDs

Family History of NCD	Total % (n)	Current Diseased Condition		Chi square
		DM% (n)	DM+HL% (n)	
Yes	76.6 (85)	71.76 (61)	28.24 (24)	0.980 ^{NS}
No	23.4 (26)	61.54 (16)	38.46 (10)	

*Significance tested at CI=95%, NS=Non Significant

Diet plays a vital role in disease prevention and management, over and above literature has documented several health-benefiting effects of millets especially against non-communicable diseases. Therefore occurrence of diabetes and hyperlipidaemia was assessed against millet consumption among the selected subjects.

Majority of the diabetic subjects (90%) as well as those having diabetes and hyperlipidaemia (79%) did consume millets in their diets, however no significant difference was computed between the disease profile and millet consumption pattern among the subjects (Table 4). Findings of the study thus indicate that the beneficial effect of millet on health could be evident after long and consistent habit of consuming the millets.

Table 4: Millet consumption among diabetic and hyperlipidemic subjects surveyed under the study

Disease Condition	Total % (n)	Millet Consumption		Chi square
		Yes	No	
Diabetes Mellitus	69 (77)	90 (69)	10 (8)	2.099 ^{NS}
DM +Hyperlipidaemia	31 (34)	79 (27)	21 (7)	

*Significance tested at CI=95%, NS=Non Significant

Perceptions, awareness and knowledge regarding millets among the subjects

Millets like sorghum (jowar), pearl millet (bajra) etc. have always been stereotyped as the grains for the underprivileged. They are associated with either seeds given to birds or thick rotis to eat for a rural event or a dish to be had occasionally (<http://www.medindia.net>).

In order to understand the millet consumption pattern, the selected subjects were questioned on their knowledge regarding types of millets, its recipes, its usage and its benefits. Commonly cultivated and consumed millets namely Bajra, Jowar, Ragi and Kodri were enlisted by the subjects (Table 5). *Bhakri and Thalipeeth* were the commonly consumed recipes of prepared from the millets. Of all the recipes, mentioned khichadi was least rated and many snack items prepared from millets were enlisted (Table 6). As per the respondents, these millets were consumed seasonally, based on the traditional knowledge of being "Hot" or "Cold" food, while kodri was consumed during fast.

Table 5: Emic views of the subjects regarding millet based recipes and its consumption

Millets (through diet counselling)	Maharashtrian recipe	Reasons of consumption
Bajra	Bhakri, thalipeeth	Consumed predominantly in winters since it is considered as a “hot” food.
Jowar	Bhakri, thalipeeth	Consumed predominantly in summers since it is considered as a “cold” food.
Ragi	Bhakri, laddu, kheer, ambil	It is also considered as a “cold” food, hence consumed more in summers.
Kodri	Rice, thalipeeth	It is consumed mainly during “fasts”.

Table 6: Awareness about millet recipes and its consumption by subjects

Recipe	Total % (n)	Males % (n)	Females % (n)
Bhakri	98.2 (109)	45.9 (50)	54.1 (59)
Thalipeeth	89.2 (99)	43.4 (43)	56.6 (56)
Khichadi	6.3 (7)	28.6 (2)	71.4 (5)
Snack items	40.5 (45)	37.8 (17)	62.2 (28)

**Note: The frequencies and percentages have many overlapping values due multiple answering*

As per 55% of the subjects, one major reason of consuming millets was that it was consumed since childhood; 22% consumed millets as they liked the recipes made from it (Table 7). However 11% subjects could not give any reason for millet consumption and 6% consumed it either because they thought that it was healthy or because they were advised to consume it. All the women subjects interviewed reported that they were aware of millets, its recipes and health benefits and hence consumed it.

Table 7: Reasons for millet consumption

Reason	Males (n= 44)	Females (n= 52)	Total (n=96)
Consumed since childhood	45.28 (24)	54.72 (29)	55.21 (53)
Like	48(12)	52 (13)	26.04 (25)
Aware	0 (0)	100 (4)	4.12 (4)
Advice	0	100 (2)	2.08 (2)
Easy to prepare	0	100 (1)	1.04 (1)
No reason	72.73(8)	27.27 (3)	11.46 (11)

Table 8 mentions about the reasons for not consuming millets. Since the subjects had not consumed millets from childhood (27%), they did not consume it even now and rest 27% had no reason for not eating millets. Millet based recipes were not prepared at 20% respondents households; hence they did not eat it, while 13% did not like millets. Thus traditional and custom based practices, convenience, preference are some of the important reasons that influence millet consumption among residents of Pune. Table 9 depicts the relation between different levels of education and consultation with the dietician. There was no statistically significant difference between the education level of the subjects and consultation with the dietician. The results reveal that 72.7% patients with only primary education, 78.8% with higher secondary education and 66.7% illiterates did not consult a dietician. Except the secondary school education group, all the other groups showed a similar trend of following dietary pattern without the consultancy of a dietician.

Table 8: Reasons for not consuming millets

Reason	Males (n= 8)	Females (n= 7)	Total (n=96)
Not consumed since childhood	75 (3)	25 (1)	26.67 (4)
No reason	25 (1)	75 (3)	26.67 (4)
Not prepared at home	66.67 (2)	33.33 (1)	20 (3)
Dislike	50 (1)	50 (1)	13.33 (2)
Advice	0 (0)	100 (1)	6.67 (1)
Sugar increases	100 (1)	0 (0)	6.67 (1)

Table 9: Relation between education level and consultation with dietician

Dietician consultation	Education level of the subjects				Chi square
	Illiterate (n=3)	Primary (n=22)	Secondary (n=6)	≥ Higher Secondary (n=80)	
Yes	33.33 (1)	27.27 (6)	50 (3)	21.25 (17)	2.796 ^{NS}
No	66.67 (2)	72.73 (16)	50 (3)	78.75 (63)	

*Significance tested at CI=95%, NS=Not Significant

Table 10 illustrates the awareness and consultation on health benefits of millets among the subjects. There is no significant difference in millet consumption among those who were aware about the health benefits, neither among those who consulted a dietician and those who did not.

Table 10: Awareness and consultation services on health benefits of millets among the selected subjects

	Millet Consumption						Chi square
	Yes			No			
	Total	Males	Females	Total	Males	Females	
Awareness among the subjects (n=21)	85.7 (18)	15.39 (8)	16.95 (10)	14.3 (3)	3.85 (2)	1.69 (1)	0.013
Chi square	0.006						
Awareness due to dietary consultation by the dietician (n=27)	88.9 (24)	17.31 (9)	25.42 (15)	11.1 (3)	1.92 (1)	3.39 (2)	0.176
Chi square	1.379						

Apart from health based awareness, the subjects were also questioned regarding the nutritive value of millets and their usage in alcoholic and non-alcoholic beverages. However none of the respondents were aware of these topics and could not respond to the questions. Disappearing traditional habits and customs have resulted in poor knowledge and awareness among the people, thus emphasizing the need to promote the use of rapidly vanishing millets.

Commonly cultivated and consumed millets namely Bajra, Jowar, Ragi and Kodri were enlisted by the subjects and *Bhakri* and *Thalipeeth* were the commonly consumed recipes. Consumption of millets was based on the traditional knowledge of being “Hot” or “Cold” food. As per 55% of the subjects, one major reason of consuming millets was that it was consumed since childhood. All the women subjects interviewed reported that they were aware of millets, its recipes and health benefits and hence consumed it. None of the respondents were aware about the nutritive value and usage in alcoholic and non-alcoholic beverages and could not respond to the questions. The results reveal that 72.7% patients with only primary education, 78.8% with higher secondary education and 66.7% illiterates did not consult a dietician. There was no statistically significant difference between the education level of the subjects and consultation with the dietician.

DISCUSSION

Alarmingly, NCD-related mortality is occurring at earlier ages in developing countries: 29 percent of NCD-related deaths in developing countries occur before age 60, compared with 13 percent in developed countries (Engelgau et al, 2011). NCDs are now affecting more people who are in their prime economically productive years, and these deaths are frequently preceded by years of disability.

NCDs share four main behavioural risk factors, all of which will likely escalate in developing countries: tobacco use, harmful use of alcohol, insufficient physical activity, and unhealthy diet/obesity. According to the World Bank, more than half of the NCD burden could be avoided through health promotion and prevention initiatives²⁹. Relying solely on treatment options to combat NCDs is very costly, particularly in developing countries where governments and health infrastructures are unprepared to respond to this growing problem. A focus on strengthening protective factors and earlier investment in prevention of NCDs among young people is therefore essential³.

Millets are good sources of components such as fat (2.78 g/100 g), proteins (9.98 g/100 g) (NIN, 2010). Millets are also a rich source of components like antioxidants, minerals, vitamins, lignans and phenolic compounds, which may have a positive impact on diseases such as Type 2 Diabetes Mellitus, Heart diseases, Cancer and others²⁰. Various studies conducted on millets such as Sorghum, finger millet and proso millet, *S. italica* (foxtail millet)^{1,14} have shown their beneficial effects as anti hyperglycemic and hypolipidemic agents, which may be attributable to various phytochemicals such as tannins, phenolic acids, anthocyanins, phytosterols and policosanols. However the role of millets in the MNT for diabetes is unclear as the glycemic values of several millets and their regional traditional preparations is unknown.

A survey of food consumption practices among 73 Asian-Indian adults in the New York City and Washington, D.C., areas showed that acculturation of this population in the United States has led to more frequent selection of American or other ethnic foods for main meals and replacement of traditional sweets with cookies, doughnuts, and other Western pastries.

The food habit of Indians is mostly vegetarian. Cereals, pulses, fruits, vegetables, milk and milk products, nuts, sugars and spices from the core ingredients of all Indian recipes. There is diversity in Indian cuisine. Indian cuisine encompasses a wide variety of regional cuisines native to India. Given the range of diversity in soil type, climate and occupations, these cuisines vary significantly from each other. The development of these cuisines has been shaped by various religious beliefs and foreign influences and in particular by vegetarianism, which is a growing dietary trend in Indian society⁸. Indian cuisine has been and is still evolving, as a result of the nation's cultural interactions with other societies (Chandra and Chandra, 2008; Indianfoodsco.com). Thus, diet counselling to patients should differ based on the regional practices and customs.

Millets are concentrated sources of energy and can play an important role in food security²⁰. It is well documented that consumption of whole grains, even without reduction in overall carbohydrate intake, reduces risk factors for CVD, including BMI, insulin sensitivity, and type 2 diabetes. Various epidemiologic cohort studies have demonstrated that a 2- or 3-serving-per-day increase in whole grain consumption is associated with a 20–30% decrease in type 2 diabetes, even after adjustment for confounders such as age, gender, and BMI^{7,27,19}.

An Indian study comparing pearl millet (*bajra*), barley, and corn found that glycemic response to pearl millet (*bajra*) and barley, but not corn, was significantly lower than glycemic response to white bread, particularly in individuals who did not already have Type 2 diabetes²³.

For diabetic patients in India, it has been shown that wheat-based and millet-based formulations yield lower glycemic indices than rice-based formulations²².

Because they are digested more slowly than refined grains, which have been stripped of the germ and bran that cover the starchy endosperm, whole grains maintain a lower glucose and insulin response in the body than refined grains^{19,25}. Carbohydrates present in finger millet are slowly digested and assimilated than those present in other cereals. Regular consumption of finger millet is known to reduce the risk of diabetes mellitus and gastrointestinal tract disorders and these properties were attributed to its high polyphenols and dietary fiber contents⁵. Finger millet diets lowered blood glucose and cholesterol in diabetic rat models¹⁵.

The presence of flavonoids, such as tricetin, acacetin, 3, 4 Di-OMe luteolin, and 4-OMe tricetin, indicate the chemo preventive efficacy of pearl millet. They may be inversely related to mortality from coronary heart disease and to the incidence of heart attacks in the pearl millet consuming belts of the world²⁰.

Thus it is recommended that with rising trends in diabetes and other non communicable diseases, “ETIC” view or scientific facts on millets remain only in textbooks and research journals unless rigorously promoted in the community. Medical fraternity need to join hands to employ adequately trained nutritionist to impart counselling to diabetics in their diabetes clinics. Promotion of millets which are repository of flavonoids and fibre along with minerals and energy need to be promoted using effective communication skills for prevention and treatment of diabetes.

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