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A Cross Sectional Study on Compliance to Diet Self Care among Adult Diabetics in an Urban Resettlement Colony of East Delhi

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ABSTRACT

Background: Medical nutrition therapy can control blood sugars during early stage. Recognizing patients prone to non-compliance to diet-care is of utmost importance. This study aimed to find the level of diabetic diet-care among adult diabetics in East Delhi.
Methods: In a cross sectional study, 150 adult diabetics in a resettlement colony of East Delhi were enrolled. Eight diabetics, each from all 21 sub-blocks were randomly sampled. Data was collected using diet items of revised Summary of Diabetes Self-Care Activities. Frequency of diet-care as number of days/week (0-7) and mean scores were calculated. The predictors of non-compliance were found using linear regression.
Results: Fifty-two subjects (30.9%) practiced diet control for all days/week. Totally, 25.6% did not control their diet even for one day. Small proportion of 0-7.1% reported intake of >5 servings of fruits/vegetables. A total of 36.9% diabetics consumed high fat foods every day. The mean general diet scores ranged 0-7 with 25% not following diet-care even for a day. Special diet scores ranged 2-7 with 1.8% scoring 7. Absence of family support (p=0.022), treating with own funds (p=0.014) and inadequate advice on diet control (p=0.046) had inverse influence on general score, while being illiterate (p=0.028), and substance abuse (p=0.010) had negative influence on specific diet score.
Conclusion: The overall diet-care among diabetics was low. The predictors of non-compliance were literacy status, family support, finances, advice on diet-care and substance abuse. Focussed nutritional assessment of diabetics and recommending diet should be done as a regular patient management strategy.

Introduction

Diabetes is one of the major global public health issues with half a billion people being affected worldwide. According to 2019 estimates, there are 463 million people living with diabetes and has been projected to have a 51% rise; i.e., 700 million diabetic people by 2045 (1). As of 2017, India has a diabetes burden of 67.8 million, ranking second

globally in diabetes burden (2). Diabetes is a chronic disease, requiring a multipronged approach for its management, wherein the patient has an important role to play. A diabetic patient should follow certain self-care practices in order to achieve an optimal glycemic control and prevent complications such as neuropathy, nephropathy and retinopathy, etc. Self-care as per WHO is what people do for themselves to establish and maintain health, prevent illness or deal with it. It is a broad concept encompassing hygiene (general and personal), nutrition (type and quality of food eaten), lifestyle (sporting activities, leisure, etc.), environmental factors (living conditions, social habits, etc.), socioeconomic factors (income level, cultural beliefs, etc.), and self-medication (2).

Diabetic diet self-care is very important and medical nutrition therapy is included as a treatment modality of diabetes to control blood sugars at the earlier phase of the disease, as well as long term to prevent complications. In a hospital setting, diabtes has to be managed by a health team including a physician, diatecian, health educator and field workers. A clinician along with making the diagnosis and giving the medical treatment should advise the patient about diet and other life style modifications. Medical nutrition therapy should be done in a focused manner by a physician and a dietician according to the blood sugar levels of the patients during each follow up visit. Recognizing patients prone to non-compliance to treatment and dietary modification should be ensured through follow up field visit by grass root level workers (2). The aim of this study was to find out the level of diabetic diet self-care among adult diabetics in East Delhi and also to find out the predictors of non-compliance to diabetic diet self-care.

Materials and Methods

A cross sectional study was conducted from 2014 to 2016 in a resettlement colony of East Delhi, India. The study participants were known diabetic patients, 20 years and above, residing in East Delhi for more than 6 months. Terminally, ill patients and mentally unfit to comprehend questions were excluded from the study. Regarding the sample Size, we considered the prevalence of compliance to diabetic diet compliance as 50% (so as to get the maximum sample size) at an absolute precision of 10% and at 95% confidence level, the sample size came out to be 100. A design effect of 1.5 was applied to make allowance for heterogeneity, which gave the revised sample size of 150.

There are 21 sub blocks in Nand Nagri, a resettlement colony of East Delhi, namely A1-A4, B1-B6, C1-C3, D1-D3 and E1-E5. Totally, 8 Subjects were taken from each of the 21 sub blocks. For each sub block, a complete list of serially houses numbered 1-500 was prepared and first house was randomly selected using random number table. Subsequent houses to the right were included in the study till 8 houses were enrolled from each sub block. The same procedure was followed in all 21 sub blocks. Eligible adult diabtic patients in these houses were the unit of inquiry. In houses that had more than one diabetic patient, one of them was randomly included in the study as the diet pattern of people residing in the same household will be similar. After explaining purpose of the study and getting an informed written consent, data collection was done by face to face interview. At the end of the data collection, all patients were counselled regarding diabtetic diet.

Study tools were general and specific diet components of core and additional diet related items of revised version of Summary of Diabetes Self-Care Activities (SDSCA) (3). A Hindi translated and validated version of this questionnaire was utilized. It has 4 questions on diet (2 each for general and specific diet), and it also provides items related to diet as 'additional items' for diabetic diet Self-Care Recommendations. A self-prepared, semi open ended questionnaire was prepared by investigator which included information on socio-demographic profile, detailed diseases and treatment profile that was also included for the study. The study was approved by Ethics Committee of our institution and was based on Helsinki Declaration. The data was entered into MS EXCEL further analysed using SPSS software (Version 24.0, Chicago, IL, USA). Descriptive tables were generated. Scoring was done as mentioned by the authors of the questionnaire. General diet score was found using mean score of items number 1 and 2. Specific diet score was calculated by finding mean of items 3 and 4, after reversing the item 4. For all questions regarding diet, the response was recorded as the minimum number of days per last week on the scale of 0-7, while the diabetic patients were followed for the diet pattern. Later on, mean scores were calculated for the domains. The factors associated with levels of diabetic diet self-care was found using Mann Whitney test. Multivariate analysis was undertaken utilizing linear regression.

Results

The mean age of study participants was 54 years. Totally, 47.6% of males and 86.9% were Hindus. The literacy status of our study participants was poor with 41.7% illiterates. Almost 23% of patients belonged to below poverty line. The most common complications among diabetic patients were retinopathy (111, 66.1%) and neuropathy

(110, 65.5%). Among the diabetic patients, the commonest comorbidity was hypertension (71, 42.3%). Family support to take care of the disease was noticed among 152 (90.5%) of diabetics. In our study, it was noted that 21 (12.5%) subjects did not receive any self-care recommendation on diet from the treating facility. Among those who received advice, the majority was advised by their doctors to eat very few sweets (85.1%) and follow a low fat eating plan (64.3%, Figure 1).

Table 1 depicts the general diet and specific diet items in the questionnaire along with the responses as number of days/week in the previous 1 week. General diet and specific diet components of diabetic care constituted two questions each. Only 52 study subjects (30.9%) reported having practiced diet

control for all 7 days in the previous week. Forty-three (25.6%) of study subjects did not control their diet even for one day. Very small proportion of study subjects ranging from 0 to 7.1% reported intake of >5 servings of fruits/vegetables. Sixty-two (36.9%) study subjects consumed high fat foods every day. A total of 17.9% of the patients were admitted to consuming food items with a high fat content for two days in the previous week. Also, 22.6% of the people were strict with their dietary intake, i.e. they did not consume any food items with a high fat content.

The genral diet and specific diet scores were calculated as the mean score of the respective items in the questionnaire. The mean general diet scores ranged from 0 to 7 with majority (25%) not following diet self-care even for a day. Table 2 shows
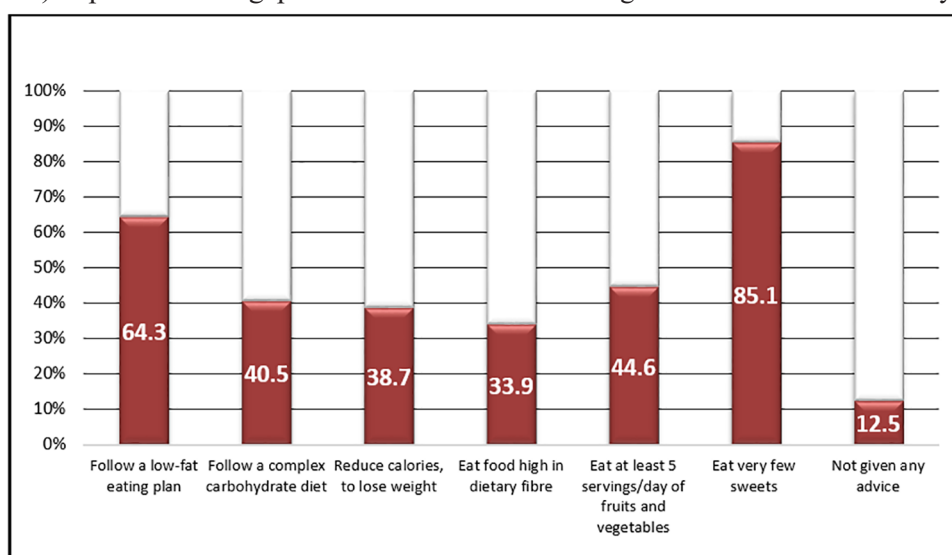

Figure 1: Self care recommendations on diet received to study subjects.

Table 1: Diet control among study subjects (n=168).

Item of questionnaire	Number of days in a week (n)							
	0	1	2	3	4	5	6	7
No. of days in last week the study subjects practiced diet control	43 (25.6)	1 (0.6)	11 (6.5)	8 (4.8)	10 (6)	28 (16.7)	15 (8.9)	52 (30.9)
No. of days/week eating plan followed by study subjects over past one month	43 (25.6)	1 (0.6)	12 (6.5)	8 (4.8)	11 (6)	26 (16.7)	15 (8.9)	52 (30.9)
Intake of ≥5 servings of fruits/veg/day in last 1 week among study subjects	141 (83.9)	0	2 (1.2)	3 (1.8)	3 (1.8)	12 (7.1)	0	7 (4.2)
Intake of high fat foods such as red meat or full-fat dairy products among study subjects	38 (22.6)	14 (8.3)	30 (17.9)	12 (7.1)	5 (3)	5 (3)	2 (1.2)	62 (36.9)

Figures in parentheses indicate in percentages.

Table 2: Mean general and specific diabetic self-care score among study subjects (n=168).

Mean scores	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
General diet (%)	43 (25.6)	0	1 (0.6)	0	11 (6.5)	0	8 (4.8)	1 (0.6)	10 (6)	1 (0.6)	26 (15.5)	0	15 (8.9)	0	62 (31)
Specific diet (%)	0	0	0	0	15 (8.9)	31 (18.5)	13 (7.7)	82 (48.8)	1 (0.6)	3 (1.8)	5 (3)	3 (1.8)	10 (6)	2 (1.2)	3 (1.8)

that 52 subjects (31%) had maximum score of 7 for general diet; while 43 (25.6%) subjects had the least score, i.e. 0. The special diet scores in the present study ranged from 2 to 7. Only 3 (1.8%) subjects had maximum score of 7, while 82 (48.8%) of subjects had special diet score of 3.5% (Table 2). Spacing of the carbohydrates was assesed using one

question given in the additional set of questons in SDSCA questionnaire. It was noted that spacing of carbohydrates was not practised even for a single day in the previous week by 73.8% of study subjects; while 10.1% participants practiced it for all the 7 days. Totally, 13.1% of diabetic patients spaced carbohydrates for 5 days in past one week.

Table 3: Association of general and specific diet score with socio-demographic factors, diseases and treatment profiles of respondents (Mann Whitney test).

Socio demographic factors			General diet score		Specific diet score	
Variable	Category	n (%)	Median (IQR)	*p* value	Median (IQR)	*p* value
Age group (years)	≤49	42 (25)	5 (2-7)	0.909	3.5 (2.5-4.1)	0.618
	≥50	126 (75)	5 (0-7)		3.5 (2.5-3.5)	
Gender	Male	80 (47.6)	5 (0-7)	0.495	3.5 (2.5-3.5)	0.855
	Female	88 (52.4)	5 (2-7)		3.5 (2.5-3.5)	
Religion	Hindu	146 (86.9)	5 (0-7)	0.879	3.5 (2.5-3.5)	0.141
	Others	22 (13.1)	4.3 (0-6.3)		3.0 (2.5-3.6)	
Family type	Joint	118 (70.2)	5 (0-7)	0.465	3.5 (2.5-3.5)	0.287
	Nuclear	50 (29.8)	5 (0-7)		3.5 (2.5-3.5)	
Marital status	Married	136 (81.0)	5 (0-7)	0.695	3.5 (2.5-3.5)	0.878
	Others	32 (19.0)	5 (0.5-6.8)		3.5 (2.5-4.4)	
Literacy status	Illiterate	70 (41.7)	5 (0-7)	0.470	3.5 (2.5-3.5)	0.072
	Literate	98 (58.3)	5 (2-7)		3.5 (3-3.5)	
Occupation status	Unemployed	99 (58.9)	5 (2-7)	0.942	3.5 (2.5-3.5)	0.555
	Employed	69 (41.1)	5 (0-7)		3.5 (3-3.5)	
Per capita income	BPL	39 (23.2)	5 (2-7)	0.239	3.5 (2.5-3.5)	0.539
	APL	129 (76.8)	5 (0-7)		3.5 (2.5-3.5)	
Socio- economic status	Lower	88 (52.4)	5 (2-7)	0.833	3.5 (2.5-3.5)	0.318
	Middle and above	80 (47.6)	5 (0-7)		3.5 (3-3.5)	
Substance abuse	Current user	48 (28.6)	5 (2-7)	0.134	3.5 (3-3.5)	0.051
	Never/Past user	120 (71.4)	4 (0-7)		3.5 (2.5-3.5)	
Family support	Present	152 (90.5)	5 (2-7)	0.020	3.5 (3-3.5)	0.676
	Absent	16 (9.5)	0 (0-6)		3.5 (2.5-3.5)	
Disease profile						
Place of diagnosis	Government hospital	69 (41.1)	5 (2-7)	0.033	3.5 (2.5-3.5)	0.315
	Private hospital	99 (58.9)	5 (0-6)		3.5 (2.5-3.5)	
Complications	With complications	146 (86.9)	4 (0-7)	0.481	3.5 (2.5-3.5)	0.476
	Without complications	22 (13.1)	5 (0-7)		3.5 (2.5-3.5)	
Systemic illness	With systemic disease	91 (54.2)	5 (0-7)	0.576	3.5 (2.5-3.5)	0.463
	Without systemic disease	77 (45.8)	5 (2-7)		3.5 (3-3.5)	
Depression	With depression	73 (43.5)	5 (0-7)	0.974	3.5 (2.5-3.5)	0.460
	Without depression	95 (56.5)	5 (2-7)		3.5 (2.5-3.5)	
Disease duration	<5 years	72 (42.9)	5 (0.5-7)	0.900	3.5 (2.5-3.5)	0.434
	≥5 years	96 (57.1)	5 (0-7)		3.5 (2.5-3.5)	
Treatment profile						
Treatment support	Own funds	96 (57.1)	4 (0-6.75)	0.017	3.5 (2.5-3.5)	0.787
	Others	72 (42.9)	5 (3-7)		3.5 (2.5-3.5)	
Current treatment	With insulin	20 (11.9)	5 (2-6.75)	0.868	3.5 (2.5-3.5)	0.804
	Without insulin	148 (88.1)	5 (0-7)		3.5 (2.5-3.5)	
Advise on complications	Yes	49 (29.2)	5 (2.8-7)	0.208	3.5 (3-3.5)	0.203
	No	119 (70.8)	5 (0-7)		3.5 (2-3.5)	
Advise on diet/ Exercise	Yes	145 (86.3)	5 (2-7)	0.084	3.5 (2.5-3.5)	0.758
	No	23 (13.7)	0 (0-7)		3.5 (2.5-3.5)	

Mann Whitney test was used to find association of general diet score and specific diet score of respondents with various socio demographic factors, diseases and treatment profiles of patients (Table 3). The socio-demographic variables included age, gender, religion, family type, marital status, literacy, occupation, per capita income, socio-economic status, substance abuse and family support. The diseases and treatment profiles enrolled place of diagnosis, complications, systemic illness, depression, disease duration, treatment support, current treatment, advice on complications and advise on diet provided by doctor.

A statistically significant association was found between general diet score and diabetic patient's family support, place of diagnosis and treatment expenses. It was seen that the general diet score among diabetic patients was better than those who received family support, those diagnosed in government hospitals and those having insurance or got free treatment (p=0.020, p=0.033 and p=0.017, respectively). For Specific diet score, there was no statistically significant association between specific diet score among diabetic subjects with any of their socio-demographic factors, diseases or treatment profiles of diabetic patients (p>0.05).

There were 25 variables that were considered for univariate analysis. Among these, 25 variables had p value <0.25; i.e. 7 variables for general diet and 4 variables for specific diet were included in the multiple linear regression using step wise method and taking $p \leq 0.05$ (IN) to include the variables in the model and p>0.1 (OUT) to remove the variables from the model. Age and gender were included in the next step by enter method and thus the obtained significant predictors were adjusted among themselves and for age and gender. The remaining variables that had p value >0.25 were included individually in the final model to find the influence of these variables in multivariable analysis. None of the variables were found to be significant. The collinearity between various independent variables was tested using tolerance and it's Reciprocal Variation Inflation Factor. The tolerance varied from 0.676 to 0.915. Thus, there was no collinearity between independent variables.

To find the predictors of general diet score and self-care, out of the 7 variables added to multiple linear regression model, 3 variables were found to be statistically significant (Table 4). Absence of family support, dependence on own funds for treatment and advice on diet control not being provided had inverse influence on general diet score. On an average, decrease in diet score by absence of family support, dependence on own funds for treatment and advice on diet control not being provided was 1.71 unit (p=0.022), 1.05 unit (p=0.014) and 1.22 unit (p=0.046), respectively. The overall model was significant with p value=0.004 and adjusted R^2=0.072. For the specific diet self-care, out of the 6 variables included in stepwise multiple linear regression model, 2 variables came to be statistically significant (Table 5). Illiterate people, and subjects who were currently indulging in substance abuse were found to have negative influence on specific diet score. The decrease in specific diet score by these 2 variables, i.e. illiterate and currently indulging in substance abuse was by 0.43 units (p=0.028) and 0.55 units (p=0.010), respectively.

Table 4: Predictors of self-care activities (general diet) among study subjects.

Variable	Reference category	Unstandardized		Standardized	T value	*p* value
		B	SE	Beta (CI)		
Age (years)		0.006	0.020	0.025 (-0.014-0.064)	0.315	0.753
Gender	Male	0.330	0.418	0.059 (-0.766-0.884)	0.791	0.430
Treatment support	Others	-1.052	0.425	-0.187 (-1.026-0.652)	-2.478	0.014
Family support	Present	-1.707	0.736	-0.180 (-1.633-1.273)	-2.319	0.022
Advise on diet	Yes	-1.219	0.605	-0.150 (-1.374-1.014)	-2.013	0.046

Linear Regression, *SE: Standard Error, Reference category (assigned code=0), R^2 value=0.100, Adjusted R^2=0.072, F=3.594, p=0.004.

Table 5: Predictors of self-care activities (specific diet) among study subjects.

Variable	Reference category	Unstandardized		Standardized	T value	*p* value
		B	SE	Beta(CI)		
Age (years)		0.011	0.008	0.104 (0.088-0.120)	1.306	0.193
Gender	Male	-0.101	0.203	-0.045 (-0.446-0.356)	-0.500	0.618
Literacy status	Literate	-0.430	0.194	-0.189 (-0.572-0.194)	-2.213	0.028
Substance abuse	Never/Past user	-0.548	0.210	-0.220 (-0.635-0.195)	-2.608	0.010

Linear Regression, *SE: Standard Error, Reference code=0, R^2 value=0.068, Adjusted R^2=0.045, F=2.980, p=0.021.

Discussion

Current study highlights the diet self-care among diabetics residing in a resettlement colony of East Delhi. A successful management of diabetes relies on the individual performing dietary modifications according to blood glucose levels along with other life style modifications to control symptoms and avoid complications. The importance of diet in self management for diabetics has been noted by a number of researchers (4-6). The findings of our study showed poor diabetic diet self-care regarding general and specific diet. It was found that only 31% had practiced general diet self-care according to the diet chart provided on all days in previous 1 week and only 3% practiced specific diet modifications like 4-5 servings of fruits and vegetables as well as restriction of fat in diet. Similar results have been described in another Indian study by Gopichandran *et al.* with good dietary behaviour being present in 29% of study subjects (7).

The level of specific diet self-care in a study from Pune, India showed that only 2.8% subjects practiced special diet care on all 7 days in previous 1 week; but the general diet self-care was much better (8). Two facility-based studies conducted at Vijayawada, Andhra Pradesh (9) and Mangalore, Karnataka (10) reported 41% and 45.9% of patients following their healthy eating plans for all days of the week, respectively. The low level of self-care activities regarding diet in our study may be due to ignorance in some patients or they had not been advised regularly by treating health care personel. The meal pattern of our study population was only twice a day, use of ghee (saturated fat) was culturally more acceptable and considered more nutritious. Adding extra meals or spacing the carbohydrates into small frequent portions or shifting to poly/monosaturated fats was a difficult cultural choice for them. Seasonal fruits and vegetables being expensive also resulted in poor intake of these food items in some patients.

Adherence to accepted standard guidelines regarding both general and specific diet among diabetic patients has been shown to maintain a good glycemic control and prevent complications. Low glycemic index diets have been shown to reduce fasting and post-prandial glucose, triacylglycerol and non esterified fatty acid concentrations and the need for therapeutic insulin. It also helps in increasing HDL–cholesterol and decreasing total cholesterol, while improving insulin-mediated glucose uptake. Many studies have also demonstrated that low glycemic index diet improves insulin sensitivity in subjects with diabetes (11).

Predictors identified for self-care activity regarding general diet were family support, treatment support and advice on diet control. Absence of family support, dependence on own funds for treatment and advice on diet control not being provided had a negative effect on self-care activity for general diet. Family support had a significant role in improvement of many self-care activities by diabetic subjects. Most of the study subjects when asked about their diet habits responded that in majority of the households in NandNagri diabetic patients were consuming exactly the same meals as prepared for all other family members rather than making some minor modifications. A small effort from the care givers/family members who cooked food for the diabetic patients, like avoiding sugar in tea/coffee and ghee/oil could make great difference in the general diet self-care practiced by the diabetic patients. Therefore, family members, especially those who took care of the patients should be well aware of the dietary recommendations for diabetic patients. A focus group discussion conducted at a medical center Nashville, Tennessee found out that non supportive behaviour of family members was associated with poor drug adherence in diabetes and other self-care activities (12).

Results similar to that of our study was found in a qualitative survey conducted in South India by Kavita *et al.* (13). It was reported that family support had a significant role in improving good dietary practice among diabetic patients. Support for changing eating behavior was more likely to happen in a nuclear family compared to a large family and when food was not cooked separately for the person with diabetes and the whole family ate the same food (food as per diabetic patients requirement), compliance was likely to be better (13). In our study, subjects who received advice regarding diet control in diabetes were found to have better self-care regarding general diet. Similar results have been reported from two studies conducted in South India by Kavita *et al.* (13) and Jayakumar (14).

It was also found in our study that dependence on own funds had a negative effect on the general diet self-care among diabetic patients. Diabetes is a chronic disease and may last for many decades. Therefore the treatment entails a substantial expenditure not only on drugs but also on buying certain food items which may be expensive. Thus the finding of our study can be explained that if patients had to use their own funds for treatment, they generally found it difficult to purchase such food items as were recommended for good dietary practices for example, fruits and vegetables; whose costs at times could be pretty high.

Predictors for self-care activity regarding specific

diet were literacy status and substance abuse by the study subjects. Self-care activity regarding specific diet was lacking among study subjects who were illiterate and those who were indulging in substance abuse. Literacy status is a highly relevant factor regarding self-care for the special diet component of self-care. Specific diet includes intake of >5 servings of fruits or vegetables and avoidance of high fat food. Unless the person is literate enough, he/she may not be able to understand the importance of increased servings of fruits and vegetables in his/her meals. It was observed by the investigator that the usage of packed local food products/snacks was very common in the study area. Thus unless the person is literate enough to read the label provided over the packed food he/she would not be able to identify the calorie and fat content in the food item and restrict calories and fat accordingly. A low literacy also leads to less understanding of the self-care recommendations provided by health care team. Other researchers have also emphasized the literacy and numeracy focused diabetes intervention contributing to improving glycaemic control and diabetes self-management self-efficacy in study subjects (15).

Study subjects currently indulging in substance abuse in our study were found to be lacking self-care regarding specific diet. Substance abuse among diabetic patients can significantly enhance the risk of complication of diabetes. Moreover, it has been observed that subjects who resort to one or other type of substance abuse may be caring much less regarding their diabetic control as compared to non-substance users. Ahmed *et al.* in their study noticed that alcohol consumption was a marker for poorer adherence to diabetes self-care behaviors and there was a gradient of increasing risk for poor adherence to diabetes self-care behaviors with increasing alcohol consumption (16).

This study has some limitations. This was done as a part of a comprehensive research on diabetic self care. The study was conducted in a resettlement colony in East Delhi and the findings are generalizable only to this area and external validity may be lacking. This was a cross sectional enquiry and there was inherent limitations of the design regarding temporality. Since both the dependent and independent variables were assessed at the same time, the cause effect relationships could not be established in our study.

Conclusion

It can be concluded that the self-care practices regarding general and specific diet care among diabetic subjects was quite low. Only 31% of study subjects practiced general diet and only 1.8% for

specific diet self-care. The factors predicting for self-care activities regarding diet were literacy status, family support, funds for treatment support, advice on diet control and substance abuse of the study subjects. Since India is already the diabetic capital of the world, it is important that all hospitals have diabetic clinics for the holistic treatment and care of diabetic patients. There should be a separate counselling team comprising of dieticians and trained nursing staff, dedicated for diabetes nutrition therapy and focussed nutritional assessment of the diabetics and recommendation of a diet plan should be done as a regular patient management strategy. This should not be a onetime phenomenon at the time of diagnosis of the disease; but it should be a regular ongoing activity. Grass root level workers like ASHAs, Anganwadi workers and ANMs must be trained adequately to make diabetic patients aware of the importance of diet modification. They should also make efforts to dispel any misconceptions or myths regarding the disease and its management.

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Conflict of Interest
None declared.

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