

# Diabetes self-care activities: A community-based survey in urban southern India

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## ABSTRACT

**Background.** Diabetes is a lifestyle disease and can be successfully managed by good self-care activities such as diet, exercise, monitoring and drug adherence. Adequate baseline information about the prevalence of good self-care activities is not available from India. We aimed to estimate the existing self-care behaviours and factors influencing these behaviours among adult patients with type 2 diabetes in urban southern India.

**Methods.** A cross-sectional survey was conducted using a cluster design in an urban community in southern India. The Summary Diabetes Self-Care Activities questionnaire was used to collect information on diet, exercise, monitoring of blood sugars and adherence to drugs. Risk factors such as marital status, socioeconomic status, depression, benefit-finding and duration of illness, which are likely to influence self-care behaviour, were assessed.

**Results.** Good dietary behaviour was present in 29% (95% CI 20.8%–37.2%), good exercise behaviour in 19.5% (95% CI 17.4%–21.6%), regular blood sugar monitoring in 70% (95% CI 62.2%–77.8%) and drug adherence in 79.8% (95% CI 75.1%–84.5%). Being male (OR 3.38; 95% CI 1.541–7.407) and married (OR 5.60; 95% CI 1.242–25.212) significantly favoured good exercise behaviour. Being married (OR 2.322; 95% CI 1.104–4.883) and belonging to the higher socioeconomic status (OR 2.713; 95% CI 1.419–5.190) were significantly associated with monitoring of blood sugars.

**Conclusions.** Self-care activities with respect to diet and exercise are poor in the population studied. The self-care activities relating to blood sugar monitoring and drug adherence are good. Improving self-care behaviour among patients with diabetes in India should start with adequate targeted health education.

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## INTRODUCTION

Diabetes self-care activities are behaviours undertaken by people with or at risk of diabetes in order to successfully manage the

disease on their own.<sup>1</sup> There are seven essential self-care behaviours in people with diabetes which predict good outcomes. These are healthy eating, being physically active, monitoring of blood sugars, taking regular medications, good problem-solving skills, healthy coping skills and risk-reduction behaviours,<sup>1</sup> all of which have been reported to be positively correlated with glycaemic control, reduction of complications and improvement in quality of life.<sup>2–6</sup> In the Indian sociocultural scenario, it has been reported that adherence to treatment regimens is very poor due to poor attitude towards the disease and poor health literacy.<sup>7,8</sup> Among people with diabetes who had received diabetes health education from a treatment facility, only 30% were compliant with drug regimens, 37% with diet and 19% with exercise. Non-compliance was higher among the lower socioeconomic groups.<sup>9</sup> Poor access to drugs, high cost, unequal distribution of health providers between urban and rural areas and cultural barriers further hamper self-care activities in developing countries such as India.<sup>10–12</sup> This study was done to estimate the existing self-care behaviours and factors influencing these behaviours among adult patients with type 2 diabetes in urban southern India as a baseline for initiating good self-management programmes.

## METHODS

An urban community located in the heart of Vellore, Tamil Nadu with reasonably good access to healthcare from both the Vellore municipality healthcare system and the Christian Medical College was chosen for this survey. Data regarding self-care activities was collected from a sample in a cross-section of this community using cluster design during October 2009. The sample population included the urban service area of the Department of Community Health, Christian Medical College, Vellore, with a total population of about 40 000.

The sample size was calculated for a prevalence of positive self-management of 50% and a relative precision of 20% and a 95% confidence level. A design effect of two was used to make allowance for cluster sampling and a final sample size of 200 individuals was obtained.<sup>13</sup>

Geographically, the study area was in four large zones. The largest zone was divided into four clusters with 12 streets in each cluster. The other three zones were divided into two clusters each, with up to 15 streets in each of them. Twenty patients with diabetes were surveyed in each cluster. Identification of the patients with diabetes was done in a systematic random sampling method with a sampling interval of one. Each house was visited and any person with diabetes identified in that house was included in the survey. Consecutive houses were contacted till the sample size in the cluster was reached. The diabetic status of the subjects

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was self-reported. All patients with diabetes who were >18 years of age and independent for their activities of daily living were included in the survey. If a door was locked the house was skipped and the closest next house was contacted.

Details about self-management activities were collected using the Summary Diabetes Self-Care Activities questionnaire (SDSCA) after minor changes were made to it to suit the Indian context for foods commonly consumed and since self-monitoring of blood sugar was uncommon, the questionnaire referred to venous blood glucose testing.<sup>14</sup> The questionnaire had 12 parameters to be measured, five on diet, three on exercise, two on monitoring of sugar levels and two on drug adherence. Risk factors likely to influence self-care behaviour such as marital status, socioeconomic status,<sup>15</sup> depression, using a two-question screening instrument,<sup>16</sup> benefit-finding using a three-question instrument,<sup>17</sup> and duration of the disease were assessed.

Among the risk factors analysed, depression was categorized based on the scale used. Benefit-finding scores, on a scale of one to ten, were summed up and the total score was divided in the median and the individuals were classified as having good and poor benefit-finding. The median duration of diabetes in this population was 5 years and this cut-off was used to categorize the duration of disease. Based on the modified Kuppaswamy scale, the lower class and upper lower class were classified as lower socioeconomic status and the lower middle, upper middle and upper class were classified as higher socioeconomic status.

The questionnaire was translated into vernacular (Tamil) and back-translated into English by a person not associated with the study. The validity of translation was checked. All the investigators discussed and standardized the method of interview.

### Definitions

In the diet component of the SDSCA questionnaire, calorie restriction in meals during 75%–100% of the times in the past 1 week, vegetables and fruits accounting for >50% of the diet, fats and fried foods accounting for <25% and total avoidance of sweets were defined as good self-care behaviour. In the exercise component, exercising at least 20 minutes a day on at least 5 days in the past 1 week, exercising at least 50% of the required exercise schedule and doing non-work-related physical exercise on at least 5 days in the past 1 week were defined as good behaviours. Monitoring blood glucose levels at least once in 3 months and taking most or all of the recommended drugs or insulin were defined as treatment adherence.

The collected data were entered in Epi Info 2000 software<sup>18</sup> simultaneously by two of the investigators in two different computers and the entries were compared to detect errors. The identified errors were corrected after referring to the original data sheets. Data analysis was done using Epi Info 2000 software.

The prevalence (including 95% CI) was calculated using standard formulae<sup>13</sup> for good dietary, exercise, monitoring and drug adherence behaviour.

The odds ratios for risk factors such as sex, depression, socioeconomic status, benefit-finding, marital status and duration of diabetes were calculated. Logistic regression analysis was done to calculate adjusted odds ratios.

### RESULTS

The main occupation in the study area was rolling of cigars made of unrefined tobacco referred to as 'beedis'. Entire families including children were involved in the work, the minimum wage for which, per person per 1000 beedis rolled was ₹40. Most of the

families in the surveyed areas belonged to the lower middle and upper lower socioeconomic status according to the modified Kuppaswamy scale (Table I). A total of 700 households were contacted to complete the sample size of 200 patients with diabetes. All the contacted patients with diabetes consented to participate in the study. Thirty of the patients with diabetes identified were not available at their homes for interviewing at the time of the survey because they had gone out to work.

Thirty-five per cent of respondents successfully restricted their calories. Of all the respondents, 44% had fresh fruits and vegetables contributing to >50% of their meal and 86% of respondents had fats and fried foods contributing to <25% of the meal over the previous 7 days. Seventy-five per cent had avoided sweets in their diet. Of the respondents 69.5% did not exercise on any day in the past week. Only 21% achieved the level of exercise recommended to them. Only 20.5% did any physical exercise other than routine work in the previous week. Seventy per cent of the respondents checked their blood sugars at least once in the previous 3 months. Adherence to insulin and oral hypoglycaemic agents was 66.7% and 79%, respectively (Table II).

Good dietary behaviour was present in 29% (95% CI 20.8%–37.2%), good exercise behaviour in 19.5% (95% CI 17.4%–21.6%), regular monitoring of blood sugars in 70% (95% CI 62.2%–77.8%) and drug adherence in 79.8% (95% CI 75.1%–84.5%).

In univariate analysis of factors influencing good self-care behaviour, women exercised lesser than men (OR 0.207; 95% CI 0.098–0.438), married individuals (OR 7.938; 95% CI 1.840–34.241) and individuals who were not depressed (OR 2.151; 95% CI 1.071–4.323) exercised more than single, widowed or separated individuals and depressed persons, respectively. Monitoring blood sugar levels was more common among married persons (OR 2.538; 95% CI 1.291–4.991) and those belonging to the higher socioeconomic status (OR 3; 95% CI 1.591–5.658) than their single, widowed or separated counterparts or those from the lower socioeconomic status, respectively (Table III).

After multivariate logistic regression analysis of factors (sex, marital status, depression and socioeconomic status entered into the model simultaneously) male sex and being married was

TABLE I. Baseline characteristics of the study population

Characteristic	n (%)
Age (years)	
<40	16 (8)
41–50	58 (29)
51–60	66 (33)
61–70	41 (20.5)
71–80	19 (9.5)
Sex	
Male	82 (41)
Female	118 (59)
Marital status	
Married	152 (76)
Unmarried	7 (3.5)
Separated	1 (0.5)
Widowed	40 (20)
Socioeconomic status	
Lower	9 (4.5)
Upper lower	87 (43.5)
Lower middle	52 (26)
Upper middle	44 (22)
Upper	8 (4)
Depression	113 (56.5)

TABLE II. Individual responses to the SDSCA questionnaire and frequency of each response

SDSCA item	n (%)
What % of times did you successfully restrict your calories?	
0	54 (27)
25	16 (8)
50	60 (30)
75	20 (10)
100	50 (25)
What % of your meals were fresh fruits and vegetables?	
0	30 (15)
25	82 (41)
50	35 (17.5)
75	14 (7)
100	39 (19.5)
What % of your meals were fried items?	
0	82 (41)
25	90 (45)
50	17 (8.5)
75	9 (4.5)
100	2 (1)
What % of your meals were sweets?	
0	150 (75)
25	35 (17.5)
50	8 (4)
75	5 (2.5)
100	2 (1)
How many days did you exercise at least 20 minutes?	
0	139 (69.5)
1	2 (1)
2	2 (1)
3	1 (0.5)
4	4 (2)
5	3 (1.5)
7	49 (24.5)
What % of the required exercise did you do?	
0	151 (75.5)
25	7 (3.5)
50	11 (5.5)
75	3 (1.5)
100	28 (14)
How many days did you do exercise other than routine work?	
0	148 (74)
1	3 (1.5)
2	2 (1)
3	2 (1)
4	4 (2)
5	4 (2)
7	37 (18.5)
How many times did you check venous blood sugars in the past 3 months?	
Never	60 (30)
Once	90 (45)
More than once	50 (25)
Insulin adherence	
All	50 (25)
Most	3 (1.5)
Some	3 (1.5)
None	1 (0.5)
Not advised	188 (94)
Oral hypoglycaemic agent adherence	
All	133 (66.5)
Most	25 (12.5)
Some	23 (11.5)
None	17 (8.5)
Not advised	2 (1)

SDSCA Summary Diabetes Self-Care Activities

positively associated with good exercise behaviour and being married and belonging to higher socioeconomic status with regular monitoring of blood sugars (Table IV).

## DISCUSSION

This study was done to assess the prevalence of good diabetes self-care behaviour in an urban southern Indian community. While good diet and exercise was being followed by only 29% and 19.5% of the patients with diabetes, respectively, blood sugar monitoring and drug adherence were better with prevalence of 70% and 79.8%, respectively. A male living with his spouse and not being depressed was more likely to exercise. Being married and belonging to a higher socioeconomic status facilitated the monitoring of blood sugar levels. There was no significant influence of any of the factors on diet and drug adherence.

The construct of diabetes self-care activities is not an easy one to define. It includes diet, exercise, monitoring, drug adherence, positive coping skills, problem-solving skills and risk-reducing behaviour as described before. Only four of these behaviours were studied in this survey. There are some aspects of self-management such as self-efficacy<sup>19</sup> and health literacy which require more detailed evaluation and could significantly contribute to good self-care behaviour. Another major self-care behaviour is foot-care, which was not assessed by us. The diet component of the SDSCA questionnaire had a section on calorie restriction. In settings where awareness and literacy rates are low, the validity of the question on calorie restriction needs to be assessed. Further, it can be observed that about 45% of individuals responded that >50% of their diet consisted of fruits and vegetables. This is difficult to achieve in a low socioeconomic urban poor area. These findings need to be validated using more rigorous dietary assessment methods such as 24-hour recall or food frequency methods in future studies. Home self-monitoring of blood glucose, which can be understood as a 'behaviour', is not prevalent in the community that was studied. Whether monitoring of venous blood glucose once in 3 months could act as a substitute marker is doubtful. Nevertheless, the finding that about 70% of patients with diabetes checked their blood sugars at least once in 3 months is important. The stigma attached to chronic illnesses such as diabetes in the population studied is high. The likelihood that some of the patients with diabetes did not report their diabetic status cannot be ruled out. People with diabetes who do not want to declare their diabetes status, are the ones who might have poor self-management behaviour. Since these people were not included in the study, it is likely that the prevalence of good self-care behaviour could be an over-estimate.

In a previous facility-based study it was found that good dietary behaviour was present in 37% and regular exercise in 19%.<sup>9</sup> Almost similar results have been found in this study too. What this study adds is a perspective from a community-based sample which reflects a wholesome picture of self-care behaviour. The probable reason why the findings are not much different is because of the high community-based primary health care input from the Christian Medical College and the Vellore Corporation healthcare system in this area. The situation is likely to be different in other underserved urban populations in India.

The self-care assessment tool used in this study has not been validated in the Indian context. Experts were consulted and they ratified the content and construct validity of the tool. In retrospect, the findings of this study correlates with a previous facility-based study<sup>9</sup> and this correlation adds strength to the validity of this tool. It is nevertheless important to use a validated instrument for further studies on this topic.

TABLE III. Univariate analysis of factors favouring healthy behaviour, unadjusted odds ratios (OR) and 95% CI

Factor	Good dietary behaviour OR (95% CI)	Good exercise behaviour OR (95% CI)	Good monitoring behaviour OR (95% CI)	Good drug adherence OR (95% CI)
Female sex	1.082 (0.580–2.017)	0.207* (0.098–0.438)	0.697 (0.373–1.305)	1.202 (0.597–2.418)
Married	1.302 (0.622–2.727)	7.938* (1.840–34.241)	2.538* (1.291–4.991)	1.130 (0.504–2.530)
Not depressed	1.448 (0.784–2.676)	2.151* (1.071–4.323)	1.497 (0.804–2.786)	1.049 (0.520–2.115)
Higher socioeconomic status	0.893 (0.485–1.646)	1.087 (0.546–2.164)	3* (1.591–5.658)	1.223 (0.611–2.450)
Good benefit finding	0.945 (0.513–1.741)	1.249 (0.649–2.582)	0.963 (0.526–1.736)	1.223 (0.611–2.450)
Duration of diabetes (<5 years)	1.472 (0.779–2.776)	1.262 (0.621–2.565)	1.394 (0.757–2.567)	0.713 (0.346–1.467)

\*Significant OR

Table IV. Adjusted odds ratio using a model created with significant risk factors

Factor	Good dietary behaviour OR (95% CI)	Good exercise behaviour OR (95% CI)	Good monitoring behaviour OR (95% CI)	Good drug adherence OR (95% CI)
Female sex	1.267 (0.648–2.467)	0.296* (0.135 – 0.649)	1.036 (0.514–2.088)	1.310 (0.617–2.781)
Married	1.473 (0.672 –3.229)	5.597* (1.242–25.212)	2.322* (1.104–4.883)	1.198 (0.506–2.834)
Not depressed	1.543 (0.821–2.898)	1.919 (0.908–4.055)	1.454 (0.752–2.811)	1.085 (0.530–2.22)
Higher socioeconomic status	0.848 (0.455–1.582)	0.826 (0.392–1.741)	2.713* (1.419–5.190)	1.225 (0.603–2.490)

\*Significant OR

The instrument used in this study is the older version (1994) of the SDSCA questionnaire. Subsequently in 2000 a revised version of this tool was published.<sup>20</sup> But the older tool was used because it had items on drug adherence which were dropped in the newer tool. The instrument used for screening for depression was a simple two-question, easy-to-administer tool with strong content and construct validity. This tool too has not been validated in the southern Indian urban setting.

While interpreting factors influencing self-care behaviour, it should be borne in mind that the odds ratios calculated are prevalence odds ratios. They are subject to the 'prevalence effect', i.e. it is difficult to establish a temporal sequence. Single, widowed and separated status compared to married and living with spouse led to significantly lesser self-management behaviour which can be explained on the premise that staying with a spouse could act as a support system. It was also seen that depression led to significantly reduced self-care behaviour in the form of exercise, which can again be explained based on lack of motivation. Since the cost of monitoring blood sugars was borne by out-of-pocket expenses, the socioeconomic status had a considerable effect on it.

In conclusion, prevalence of good self-management behaviour among patients with diabetes is high with respect to monitoring of sugars and adherence to drugs but very poor with respect to diet and exercise. Some of the key factors associated with good self-management behaviours include male sex, married and living with spouse, not depressed and higher socioeconomic status. A practising clinician should be able to identify persons at risk of non-adherence and give extra attention to them to motivate self-care behaviours in them. From a public health perspective, India needs good diabetes self-management education programmes at the primary care level with emphasis on motivating good self-care behaviours especially lifestyle modification. These programmes should not happen just once, but periodic enhancement of motivation to change and sustain the change need to be provided. While organizing these education programmes adequate social support systems such as support groups, should be arranged. While they help by supporting the efforts of patients with diabetes at making a behaviour change, they also help to manage depression, helplessness and hope-

lessness, which have been identified as severe deterrents of good self-care behaviour.

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