



## Self-care practices and its determinants among diabetic population in rural Andhra Pradesh, India: A cross-sectional study

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### ABSTRACT

**Background:** Self-care practice by diabetic people is key to achieving therapeutic goals. The objectives of the study were to describe the self-care practice of adult people with type 2 diabetes in a rural area of Andhra Pradesh and to identify the determinants of poor self-care practice of this population.

**Methods:** A community-based cross-sectional study was conducted among the known diabetics in a rural PHC between November 2018 and October 2019. Self-care practices among the registered diabetes patients were described in seven domains as recommended by the American Association of Diabetes Educators (AADE). Risk factors were identified using univariate, followed by multivariate logistic regression. The risk for poor self-care score was expressed in odds ratio (OR) with 95% confidence interval (CI).

**Results:** A total of 727 participants were recruited for the study. The mean age of the participants was 57 years (SD: 9.5 years). The self-care was prominent in diet modification, physical activity, and physical activity components. The median self-care score of the participants was 14 (IQR = 12.5 to 15.5). 32.6% (95% CI: 31.6%–33.6%) participants had good self-care scores. With multivariate regression analysis, we found that widowed/separated (aOR 1.85, 95% CI: 1.2–3.0) was a risk factor for poor self-care scores; and skilled workers (aOR 0.28, 95% CI: 0.1–0.6) had a significantly lower risk compared to the unskilled workers.

**Conclusion:** Overall, self-care practices are poor in problem-solving, risk reduction and healthy coping behaviours. Low education and poor socio-economic status could be the most likely reasons for poor self-care practices.

### 1. Introduction

Diabetes is a lifelong disease with many complications, including macrovascular (peripheral artery disease, stroke, and coronary artery disease) and microvascular (retinopathy, neuropathy and nephropathy) complications.<sup>1</sup> Therefore, strict glycemic control is the therapeutic goal to delay the onset of complications and enable diabetic people to lead a quality life.<sup>2–4</sup> Compliance with medication alone is not sufficient for reasonable glycaemic control. Instead, patients must follow some set of behaviours such as healthy eating, being physically active, regular monitoring of blood sugar levels, good problem-solving skills, healthy coping skills, and risk-reduction behaviours. These are called self-care

practices, defined as behaviours are undertaken by people with or at risk of diabetes to successfully manage the disease independently.<sup>5</sup>

The morbidity and mortality due to diabetes and its complications are considerably high worldwide. Though the burden is highest in the North American countries, the number of deaths is strikingly high in the South Asian countries. The global cost of diabetes for 2015 estimated that the total cost to be 1.8% of the global GDP, with indirect cost accounting for one-third of the total estimate. In India, the burden of diabetes has been increased by two-folds since 1990.<sup>6</sup> The age-standardized disability-adjusted life-year (DALY) has increased over 40% in the last three decades.<sup>7</sup> The same report has also estimated that in India, annual direct cost of diabetes has become ₹10,585/- per annum

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and indirect cost of ₹1198/- per annum per patient.<sup>7</sup>

Beside medicines, self-care practice also plays crucial role in management of diabetes. These practices have proven effect in achieving the therapeutic goals of diabetes.<sup>8</sup> Self-care practices are not only important for the people with diabetes, these elements are critical in preventing the disease among the pre-diabetic population. Most of the elements in self-care practices bear minimal cost from the participants' point of view.<sup>9</sup> However, initiation and continuation of these practices require adequate motivation from the healthcare providers and support from the family members.<sup>10</sup>

As the management of diabetes becomes sophisticated and costly across the world, these self-care practices in diabetic patients may give better economic and therapeutic outcomes.<sup>11,12</sup> The Ministry of health and family welfare, Government of India has introduced a specific national program to address diabetes and other non-communicable diseases through the "National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS)".<sup>13</sup> The strategies adopted under this programme mainly concentrates on early diagnosis. Unfortunately, the program has only minimal scope of self-care practice among the diabetic population. As the rural population largely depends upon the government programs for the healthcare services, there is a need to understand the current self-care practices of these population. Presently, only a limited number of studies from India reported about the self-care practices.<sup>11,14,15</sup> In this background, we conducted this study to describe the self-care practice of adult people with type 2 diabetes in a rural area of Andhra Pradesh. We also looked for the common determinants of poor self-care practice of this population. Finding from this study will provide evidence for the program managers in epidemiological distribution of self-care practices in diabetes management and help to identifying the patient-level challenges for promoting these practices.

## 2. Methods

**Study design:** Community-based Cross-Sectional Study.

**Study Setting:** We conducted the study in 11 villages of Parla Primary Health Centre (PHC), a rural field practice area under the Department of Community Medicine of a tertiary medical college in Andhra Pradesh.

**Study duration:** From November 2018 to October 2019.

**Study population and sample size:** All the adult diabetic population registered in Parla Primary Health Centre were eligible to participate in the study. From the register, we identified a total of 786 eligible participants. We included all the participants those were registered in the Parla PHC. Diabetic cases that were identified after starting of the data collection in the study area, were excluded from the study.

**Sampling method:** As we attempted to recruit all the eligible population, we did not conduct any sampling method for the study.

## 3. Variables

**Outcome variables:** The self-care practices among the participants were studied in the seven domains, namely diet modification, physical activity, glucose monitoring, drug adherence, problem-solving, risk reduction (foot care, smoking, alcoholism, screening for complication) and healthy coping (or psychosocial adjustment) recommended by the American Association of Diabetes Educators (AADE) known as the "AADE 7 measures of outcome measurement".<sup>16</sup> We framed the questions related to the practice of self-care activities after considering the various scales such as "Summary of diabetes self-care activities measure (SDSCA)," "Diabetes self-management questionnaire (DSMQ)," and patient health questionnaire-2.<sup>17-19</sup> However, we modified the items in the questionnaire according to the local culture. The reliability of the modified questionnaire was 0.645.

**Scoring of self-care:** The questions on self-care practices were given scoring with a minimum of 0.25 for poor practice and a maximum of

1.00 for good practice of the respective question (Table 1). The minimum aggregate score is five, and the maximum is 20. We categorized the total self-care score into good self-care practices (score from 15.25 to 20.00), moderate self-care practices (scores from 10.25 to 15.00), and poor self-care practices (scores from 5.00 to 10.00). (Tables 1 and 3).

**Study tool and data collection:** We identified the participants with the help of village health workers like Auxiliary Nurse Midwifery (ANM), Accredited Social Health Activist (ASHA), and health worker female. We used a pre-designed and pre-tested semi-structured questionnaire for data collection. The questionnaire had two parts. In the first part, we collected information on socio-demographic variables including-age, gender, religion, marital status, education, occupation, family type, socio-economic status and facility from which treatment was taken. We classified marital status of a participant as married, never married, widowed, separated or divorced. Categorization of the education and occupation of the person was done by using modified kuppuswamy classification. Type of family could be joint, three generation or nuclear family. Socio-economic status (SES) was assigned by using modified BG Prasad classification updated for May 2021. SES was categorized in to five classes based on per-capita monthly income (PCI) as-class I (PCI:  $\geq 7863$ ), class II (PCI: 3931–7862), class III (PCI: 2359–3930), class IV (PCI: 1179–2358), and class V (PCI:  $< 1179$ ). Diabetes treatment facility was classified into government facility (such as primary health centres, community health centres, or district hospitals) and private facility (formal and informal). In the second part of the questionnaire, we questioned about the diabetes specific self-care practice in the past 30 days under the domains described in the variable section. The principal investigator interviewed all the recruited participants at their homes.

**Human subject protection:** We obtained the Institutional Ethical Committee (IEC) clearance from the Kurnool Medical College (Ref. No.-IEC06/KMC-GGH/01/14) before recruiting the study participants. Besides, we obtained written informed consent in local language from all the study participants, both for study participation and publication of the study findings.

**Statistical Methods:** We entered the data in Microsoft Excel and analyzed it with SPSS statistics 21.0 version (IBM Corp., Armonk, New York, USA). We expressed the categorical variables by proportion and continuous variables by the mean and standard deviation (SD) or median and interquartile range (IQR) depending on the data distribution. We conducted univariate analysis followed by binary logistic regression analysis to determine the risk factors of poor self-care scores. We included all the predictor variables with a p-value  $< 0.2$  in the multivariate regression analysis. We expressed the risk for poor self-care score by adjusted odds ratio (aOR) with an appropriate 95% confidence interval (CI). We considered a p-value of  $< 0.05$  as statistically significant in the final regression model.

## 4. Results

From the 786 eligible participants, we found 15 (1.9%) individuals to

**Table 1**  
Components of self-care score for adult diabetic population, Parla, Andhra Pradesh, India, 2018-19.

Component	Number of questions	Minimum score	Maximum score
1. Diet modification	7	1.75	7.00
2. Physical activity	3	0.75	3.00
3. Glucose Monitoring	2	0.50	2.00
4. Drug adherence	1	0.25	1.00
5. Problem solving	2	0.50	2.00
6. Risk reduction	4	1.00	4.00
7. Healthy coping	1	0.25	1.00
Total	20	5.00	20.00

be dead, 26 (3.3%) were non-traceable, 10 (1.3%) moved away from the present location, and 8 (1%) refused to participate. Finally, we recruited 727 participants for the study.

The mean age of the participants was 57 years (SD: 9.5 years), and the mean duration of diabetes was six years (SD 3 years). The majority of the participants were females (n = 429, 59%), belonged to poor socio-economic class (modified BG Prasad class IV and V) (n = 380, 52.3%) and were availing the treatment from government facility (n = 578, 79.5%) (Table 2).

Self-care practices: Among the sub-components of self-care, diet modification, physical activity, drug adherence, and routine blood sugar check-up were the most common self-care practices among the participants (Table 3). In diet modification, the standard practices that followed were-frequently eating green leafy vegetables (n = 379, 52.1%), complete avoidance of-eating sweets (n = 277, 38.1%) and fried food items (n = 254, 34.9%), binge eating (338, 46.5%), and skipping meals (n = 290, 39.9%). Majority of the participants eat fruits occasionally. Regular physical activities are performed by 45% (n = 327) participants, 62.9% (n = 457) were adhering to the prescribed medicines, and 55.1% (n = 401) were adhering to the blood sugar test as prescribed by the physicians. A majority (n = 397, 54.6%) were washing foot regularly as a part of their diabetic care. The standard practice was less commonly followed for the other sub-components like-eating fruits only occasionally (Not even 1 day per week) (n = 338, 46.5%), glucose monitoring during illnesses (n = 138, 19%), problem-solving like carrying sugar packets to tackle hypoglycaemia (n = 241, 33.1%), and healthy coping (Table 3).

Self-care score: The median self-care score of the participants was 14 (IQR = 12.5 to 15.5) and had a range between 7 and 19.25. Out of 727

**Table 2**  
Socio-demographic characteristics of participants.

Variables	Frequency (%)
<b>Age</b>	
≤50 years	228 (31.4%)
51–60 years	227 (31.2%)
>60 years	272 (37.4%)
<b>Gender</b>	
Male	298 (41%)
Female	429 (59%)
<b>Marital status</b>	
Married	485 (66.7%)
Widow/separated	242 (33.3)
<b>Religion</b>	
Hindu	471 (64.8%)
Muslim	99 (13.6%)
Christian	157 (21.6%)
<b>Education</b>	
Illiterate	454 (62.5%)
Primary	64 (8.8%)
Secondary	45 (6.2%)
High school	99 (13.6%)
College	65 (8.9%)
<b>Occupation</b>	
Unemployed	346 (47.6%)
Unskilled worker	131 (18%)
Semi-Skilled worker	106 (14.6%)
Skilled worker	82 (11.3%)
Semi-professional & professional	62 (8.5%)
<b>Type of family</b>	
Nuclear	705 (97%)
Joint	22 (3%)
<b>Socio-economic status</b>	
CLASS I	22 (3%)
CLASS II	122 (16.8%)
CLASS III	203 (27.9%)
CLASS IV	361 (49.7%)
CLASS V	19 (2.6%)
<b>Treatment received from</b>	
Government facility	578 (79.5%)
Private facility	149 (20.5%)

**Table 3**  
Frequency of self-care practices and their scores.

Variables	Scores allotted	Frequency (%)
<b>1. Diet modification</b>		
1.1. How many days per week did you eat green leafy vegetables?		
Not at all	0.25	0 (0%)
Not even 1 day per week (Occasionally)	0.50	0 (0%)
1 or 2 days per week (Moderately)	0.75	348 (47.9%)
≥3 days per week (Frequently)	1.00	379 (52.1%)
1.2. How many days per week did you eat fruits?		
Not at all	0.25	64 (8.8%)
Not even 1 day per week (Occasionally)	0.50	338 (46.5%)
1 or 2 days per week (Moderately)	0.75	282 (38.8%)
≥3 days per week (Frequently)	1.00	43 (5.9%)
1.3. How many days per week did you eat sweets?		
Not at all	1.00	277 (38.1%)
Not even 1 day per week (Occasionally)	0.75	332 (45.7%)
1 or 2 days per week (Moderately)	0.50	118 (16.2%)
≥3 days per week (Frequently)	0.25	0 (0%)
1.4. How many days per week did you eat fried foods?		
Not at all	1.00	254 (34.9%)
Not even 1 day per week (Occasionally)	0.75	410 (56.4)
1 or 2 days per week (Moderately)	0.50	63 (8.7%)
≥3 days per week (Frequently)	0.25	0 (0%)
1.5. How many days per week did you eat binge eating?		
Not at all	1.00	338 (46.5%)
Not even 1 day per week (Occasionally)	0.75	384 (52.8%)
1 or 2 days per week (Moderately)	0.50	5 (0.7%)
≥3 days per week (Frequently)	0.25	0 (0%)
1.6. How many days per week did you skip the meal		
Not at all	1.00	290 (39.9%)
Not even 1 day per week (Occasionally)	0.75	228 (31.4%)
1 or 2 days per week (Moderately)	0.50	154 (21.2%)
≥3 days per week (Frequently)	0.25	55 (7.5%)
1.7. Do you restrict the salt intake under 5 g per day?		
Yes	1.00	422 (58%)
No	0.25	305 (42%)
<b>2. Physical activity</b>		
2.1. Do you go for major physical activity apart from day-to-day activities?		
Yes	1.00	348 (47.9%)
No	0.25	379 (52.1%)
2.2. How many days in a week you spent for physical activity?		
None	0.25	379 (2.1%)
1 or 2 days	0.50	0 (0%)
3 days	0.75	21 (2.9%)
≥ 4 days	1.00	327 (45%)
2.3. How much time in each day you spent for physical activity?		
None	0.25	379 (52.1%)
10 min	0.50	60 (8.3%)
20 min	0.75	70 (9.6%)
≥ 30 min	1.00	218 (30%)
<b>3. Glucose Monitoring</b>		
3.1. How often will you check your blood glucose levels?		
As per doctor advice	1.00	401 (55.1%)
Not as per doctor advice	0.25	326 (44.9%)
3.2. Will you check blood glucose levels during illness episode		
Yes	1.00	138 (19%)
No	0.25	589 (81%)
<b>4. Drug adherence</b>		
4.1. Are you taking medications prescribed to you on regular basis?		
Yes	1.00	457 (62.9%)
No	0.25	270 (37.1%)
<b>5. Problem solving</b>		

(continued on next page)

Table 3 (continued)

Variables	Scores allotted	Frequency (%)
5.1. Do you carry sugar packets to tackle hypoglycemia state?		
Yes	1.00	241 (33.1%)
No	0.25	486 (66.9%)
5.2. What will you do if you notice elevated blood glucose levels beyond 200 mg/dl?		
Consult doctor	1.00	274 (37.7%)
Nothing done	0.25	453 (62.3%)
<b>6. Risk Reduction</b>		
6.1. Do you know that Diabetes mellitus will cause complications?		
Yes	1.00	615 (84.6%)
No	0.25	112 (15.4%)
6.2. Are you checking foot regularly for cracks?		
Yes	1.00	493 (67.8%)
No	0.25	234 (32.2%)
6.3. Do you wash foot regularly?		
Yes	1.00	397 (54.6%)
No	0.25	330 (45.4%)
6.4. Did you stopped smoking after you diagnosed with diabetes mellitus?		
Yes	1.00	172 (23.7%)
No	0.25	65 (8.9%)
Not at all smoked	1.00	490 (67.4%)
<b>7. Healthy Coping</b>		
7.1. Are you experiencing any episode of lack of interest in doing things due to disease or treatment		
Yes	0.25	154 (21.2%)
No	1.00	573 (78.8%)

diabetic patients studied, about 237 (32.6%; 95% CI: 31.6%–33.6%) participants have good self-care scores, 467 (64.2%) participants have moderate self-care scores and only 23 (3.2%) participants have poor self-care scores.

In Univariate analysis, factors such as female gender (OR 2.15, 95% CI 1.6–3.0), single, widowed or separated (OR 2.49, 95% CI 1.7–3.6), illiterates (OR 2.10, 95% CI 1.2–3.6) and poor socio-economic status participants (OR 1.86, 95% CI 1.3–2.8) have a significantly higher risk for moderate to poor self-care scores. On the contrary, the risk is significantly low for the skilled workers (OR 0.37, 95% CI 0.2–0.7) (Table 4). With multivariate regression analysis, we found that widowed/separated (OR 1.85, 95% CI 1.2–3.0) was significantly associated with moderate to poor self-care scores; and skilled workers had a significantly low risk (OR 0.28, 95% CI 0.1–0.6) for moderate to poor self-care scores (Table 4).

## 5. Discussion

This study describes the different components of self-care practices of diabetes patients residing in rural communities of southern India. The practice is more frequent for domains like diet modification, physical activity, drug adherence and routine blood sugar check-up than glucose monitoring during illnesses, problem-solving, risk reduction and healthy coping. Only one-third of the participants are following a good self-care practice. Diabetic people who are separated or widowed are at risk of poor self-care practice.

The American Diabetes Association (ADA) stresses the importance of achieving glycemic control in diabetes patients to prevent the onset and/or advancement of diabetes complications and improve quality of life.<sup>20</sup> The ADA suggested that patients learn some practices to manage this chronic condition and addresses diabetes self-management education and support (DSME/S) at four critical times: at diagnosis, annually, when complicating factors arise, and when transitions in care occur.<sup>21</sup> However, successful management of diabetes is often challenging. These challenges can be at various levels, including the health system-level or

Table 4

Determinants of moderate to poor self-care scores using regression analysis.

Variables	No. Of patients		Risk for moderate to poor scores	
	Good score (n = 237) (%)	Moderate to Poor scores (n = 490) (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
<b>Age</b>				
≤50 years	71 (31.1%)	157 (68.9%)	Reference category	
51–60 years	67 (29.5%)	160 (70.5%)	1.08 (0.7–1.6)	-
>60 years	99 (36.4%)	173 (63.6%)	0.79 (0.5–1.2)	-
<b>Gender</b>				
Male	127 (42.6%)	171 (57.4%)	Reference category	
Female	110 (25.6%)	319 (74.4%)	2.15* (1.6–3.0)	1.20 (0.8–1.8)
<b>Religion</b>				
Muslim	37 (37.4%)	62 (62.6%)	Reference category	
Hindu	142 (30.1%)	329 (69.9%)	1.38 (0.9–2.2)	-
Christian	58 (36.9%)	99 (63.1%)	1.02 (0.6–1.7)	-
<b>Marital status</b>				
With partner	188 (38.8%)	297 (61.2%)	Reference category	
Not with partner	49 (20.2%)	193 (79.8%)	2.49* (1.7–3.6)	1.85* (1.2–3.0)
<b>Educational status</b>				
College	29 (44.6%)	36 (55.4%)	Reference category	
High school	47 (47.5%)	52 (52.5%)	0.89 (0.5–1.7)	1.03 (0.5–2.1)
Primary & Secondary	35 (32.1%)	74 (67.9%)	1.70 (0.9–3.2)	1.51 (0.7–3.5)
Illiterate	126 (27.8%)	328 (72.2%)	2.10* (1.2–3.6)	1.41 (0.7–3.0)
<b>Occupation</b>				
Semi-professional	22 (35.5%)	40 (64.5%)	Reference category	
Skilled	49 (59.8%)	33 (40.2%)	0.37* (0.2–0.7)	0.28* (0.1–0.6)
Semi-skilled	27 (25.5%)	79 (74.5%)	1.61 (0.8–3.2)	0.80 (0.3–2.0)
Unskilled	44 (33.6%)	87 (66.4%)	1.09 (0.6–2.1)	0.54 (0.2–1.3)
Unemployed	95 (27.5%)	251 (72.5%)	1.45 (0.8–2.6)	0.61 (0.3–1.4)
<b>Type of family</b>				
Joint	11 (50%)	11 (50%)	Reference category	
Nuclear	226 (32.1%)	479 (67.9%)	2.12 (0.9–5.0)	-
<b>Socio-economic status</b>				
Class II & I	58 (40.3%)	86 (59.7%)	Reference category	
Class III	78 (38.4%)	125 (61.6%)	1.08 (0.7–1.7)	1.00 (0.6–1.7)
Class V & IV	101 (26.6%)	279 (73.4%)	1.86* (1.3–2.8)	1.50 (0.9–2.5)
<b>Duration of DM</b>				
≤5 years	147 (34.6%)	278 (65.4%)	Reference category	
6–10 years	75 (31.3%)	165 (68.8%)	1.16 (0.8–1.6)	-
>10 years	15 (24.2%)	47 (75.8%)	1.66 (0.9–3.1)	-
<b>Treatment received from</b>				
Government facility	181 (31.3%)	397 (68.7%)	Reference category	
Private facility	56 (37.6%)	93 (62.4%)	0.76 (0.5–1.1)	0.92 (0.6–1.4)

\*Statistically significant.

individual-level, and the types of challenges vary in different parts of the world.<sup>22–25</sup> At the individual level, besides compliance with the medicines, a sustained self-care practice is required to achieve the therapeutic goals.<sup>25</sup> In India, individual self-care is often at stake due to a lack of fragmented information systems and inadequate patient support.<sup>26</sup> In our present study, we found that the self-care practice needs substantial improvement for almost two-thirds of the patients. We found that the self-care practice for diet modification, physical activity, drug adherence

and routine blood sugar check-up are the most regularly practised self-care measures. On the contrary, glucose monitoring during illness, problem-solving, risk reduction, and healthy coping were less commonly followed. Evidence from the hospital and community-based studies found a similar pattern in that the self-care practice was considerably low.<sup>11,14,15,27</sup> However, these studies also suggest that drug adherence and blood sugar monitoring are often common in this region.<sup>11,14</sup>

Our study shows that female gender, single, widowed or separated, illiterates, and poor socioeconomic status participants have a significantly higher risk for moderate to poor self-care scores. In contrast, skilled workers have a significantly lower risk. Multivariate regression analysis for the predictor variables of moderate to poor self-care scores showed that single, widowed/separated, and skilled workers have a significant association. A study from Tamil Nadu reported that female gender, married and belonging to higher socioeconomic status was positively related to good exercise and glucose monitoring behaviours.<sup>14</sup> However, the predictors of self-care may be contextual and often depend upon the individual, family, and health system-related factors. For example, good dietary practices were followed by most of the patients in our study, contrary to other studies done in India despite the low education level in our study participants.<sup>11,27</sup> Overall, married people living with spouses and other family members, high treatment costs, and poor knowledge about diabetes care are the most important predictors in the Indian settings.<sup>14,27–29</sup> Importantly, the dedicated national programme for diabetes (national programme for prevention and control of cancer, diabetes, cardiovascular diseases and stroke or NPCDCS) does not provide any scope for all the self-care components and how to support the diabetic population apart from the provision of medicine and regular investigations.<sup>13,30</sup>

Our study has a few limitations. Firstly, the scale used for assessing self-care practices is not validated in our setting and language. Nevertheless, the study identified the extent of self-care practice in detail from a large group. We expect that this information will help develop a local strategy to improve the self-care practice among the diabetic population. Secondly, we expect a certain degree of recall bias among the participants. To reduce this bias, we kept the recall period of 30 days.

## 6. Conclusions

Self-care practice is poorly practiced among people with diabetes. At individual level, poor family support, low education, and poor socioeconomic status could be the most likely reasons behind poor self-care practices. Based on the finding, we suggest the following recommendations. First, we need to teach and support the diabetic patients on self-care through the flagship NPCDCS program for management of diabetes, which is currently lacking. Second, evidence in the area of self-care is considerably low in India, and hence, we strongly suggest to generating high grade evidence on self-care practice to redesign the diabetes management component of NPCDCS. Beside the epidemiological aspect, it is imperative to know the cost-effectiveness of introducing self-care practices in the diabetes management plan from the healthcare and patients' perspective. Finally, the program managers need urgent planning to implement the self-care practice in different regions of the country to meet the desired goals of NPCDCS.

## Conflict of interest

Nil.

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