

A study on diabetes-related self-care plan and its determinants among diabetes patients in a Warangal region, Telangana, India

Wajid Syed¹, M. Menaka¹, S. Parimalakrishnan¹, Vamshi Vishnu Yamasani^{*2}

¹Department of Pharmacy, Annamalai University, Annamalai Nagar-608002, India,

²Department of Pharmacy, Aurobindo College of Pharmacy, Warangal, AP, India

The prevalence of epidemiological diseases, including diabetes, has continued to increase because of the adaption of Western culture and the lack of self-care activities among patients with diabetes. Therefore, in this cross-sectional study, we aimed to assess self-care plans and determinants among diabetes outpatients in Warangal. We conducted a prospective observational study among diabetes outpatient clinic in Warangal, India over 6 months from October 2019 to March 2020. We used the expanded Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. A P value of less than < 0.05 was considered statistically significant. Respondents (mean age, 52.3 (standard deviation (SD), 11.01) years) had an overall SDSCA score of 49.18 ± 3.57 (SD). Mean scores for the diet, physical activity, foot care, medication adherence, and blood sugar testing scales were 12.79 (SD, 1.61), 10.24 (SD, 1.77), 15.67 (SD, 1.5), 5.66 (SD, 1.17), and 4.80 (SD, 0.68), respectively. Patients' age, education, disease duration and hemoglobin A1C (HbA1C) levels of $< 7.5\%$ ($P < 0.001$) had significantly higher mean scores for blood sugar testing, diet, physical activity, and adherence ($P < 0.001$). The employment status is associated with all the domains of Summary of Diabetes Self-Care Activities ($P < 0.001$). Taken together, our results revealed that patients with diabetes in Warangal had poor self-care planning, highlighting the need for strengthening initiatives that generate awareness regarding diabetes and improving related self-care practices.

Keywords: Diabetes. Self-care. Diet control. Physical activity. Foot care. Medication adherence.

INTRODUCTION

To date, the prevalence of diabetes mellitus has continued to increase because of a variety of reasons, including the presence of comorbidities, older age, raising population, obesity, and lack of physical activity (Wild *et al.*, 2004). Diabetes mellitus is a chronic lifelong metabolic disease characterized by excess glucose in the blood with no currently available permanent cure (Rajasekharan *et al.*, 2015; Diabetes research and wellness foundation). However, this disease can be controlled through self-care activities, wherein affected patients play a role inadequate glucose control, subsequently allowing

them to lead a normal and healthy life similar to those without the disease (Toobert, Hampson, Glasgow, 2000; Raithatha, Shankar, Dinesh, 2014). As the second most affected country worldwide, with an estimated diabetes mellitus prevalence of 10.4% (the highest contributor to the healthcare system burden of the country), India has certainly contributed to the continued rise in the prevalence of diabetes mellitus.

The prevalence of complications associated with diabetes potentially depends on patient self-care management (Ravi, Kumar, Gopichandran, 2018). Self-care is defined as a personal activity involving the maintenance and care of one's health and illness, as well as the prevention of disease-related problems (Orem, 1995). To appropriately manage diabetes or achieve adequate glycemic control, patients should adhere to a healthy lifestyle, including maintaining

*Correspondence: V. V. Yamasani. Department of Pharmacy. Aurobindo College of Pharmacy. Warangal, AP, India. E-mail: pharmvishnu77@gmail.com; Wajidalisyed06@gmail.com. ORCID: <https://orcid.org/0000-0002-0886-7309>

healthy eating habits, monitoring blood sugar levels, engaging in physical activity, performing foot care, and adhering to prescribed pharmacotherapy (AADE, 2008; Coyle, Francis, Chapman, 2013). Previous reports have found that self-care planning differed according to sex and ethnic groups. Internationally, several reports have evaluated self-care practices (Coyle, Francis, Chapman, 2013). Notably, previous work among the French population reported that 70%–99% of them adhered to physician-prescribed medications, while 71% were non-compliant with physical activity (Mosnier-Pudar *et al.*, 2009). Similarly, the majority of Africans and Americans (80%) have been found to adhere to diabetic medications (Rahim-Williams, 2011). Other studies have shown an 86% adherence to blood glucose monitoring (Huang, Gorawara-Bhat, Chin, 2005) and a mean of 3.5–4.4 days in which a healthy diet was maintained (Tang *et al.*, 2018; McCann *et al.*, 2010). A recent study from Karnataka State, India, reported very low adherence to diet (12.26%), exercise (30.67%), and foot care (48.46%) (Dasappa *et al.*, 2017). Another study from the capital city of India reported that 39.3% of patients did not engage in any form of physical activity, while only 19% of the population practiced foot care (Mohandas *et al.*, 2018).

Most previous studies have indicated poor self-care among patients with diabetes concerning several aspects of daily care (Tang *et al.*, 2018; McCann *et al.*, 2010; Dasappa *et al.*, 2017; Mohandas *et al.*, 2018). However, studies have also reported that family support, insulin treatment, and knowledge regarding complications associated with the lack of foot care were significantly associated with good self-care practice (Mohandas *et al.*, 2018). Previous literature also highlighted that young age, sex, education, and employment status were associated with good self-care practice (Dasappa *et al.*, 2017). Furthermore, evidence has shown that good adherence to medication was associated with better glycemic control (Dasappa *et al.*, 2017; Mohandas *et al.*, 2018) and that poor health literacy was an important factor for poor self-care practice (Shrivastava, Shrivastava, Ramasamy, 2013; Robatsarpooshi *et al.*, 2020). Therefore, in this study, we assess the self-care plan and its determinants among diabetes outpatients in Warangal Telangana, India.

MATERIAL AND METHODS

Study design and settings

This exploratory cross-sectional study analyzed adult patients with diabetes visiting the diabetic outpatient clinic in Warangal, India, over 6 months from October 2019 to March 2020 using structured, validated, paper-based questionnaires. Data were collected using patient interviews at the outpatient clinic of the endocrinology department in a hospital within the Warangal region, India. All adult patients aged 18 and above with diabetes who visited the diabetic clinic during the study period were included in this study. Patients with gestational diabetes and mental illnesses were excluded from the study. Ethical approval for this study was obtained from independent ethics committee, India, additionally permission also obtained from the respective hospital before carrying out the study. Furthermore, the participants were informed that their data would only be used for research purposes and kept confidential. They were also assured that no risk was associated with study participation. Before answering the research questions, informed consent was obtained from the participants who were also requested to provide authentic answers.

Sample size calculation

The sample size for this study was calculated using the following formula based on previous diabetes prevalence rates (16.5%) in the region of Warangal, India (Sadanandam *et al.*, 2017).

$$n = z^2 \times p \times q/d^2$$

Where n is the sample size, z is the standard normal deviation of 1.96 corresponding to the 95% confidence interval, p is the expected prevalence in the proportion of one, q is $(1 - p)$, and d is the precision in the proportion of one. If 5% $d = 0.05$:

$$n = (1.96)^2 \times 0.165 (1-0.65)/(0.05)^2$$

$$n = 211$$

Study questionnaires

To assess the basic information of patients, data on patient demographics, such as sex, age (years), marital status (married, single, widow/widower, separated), education (literate/illiterate), employment status (employed, self-employed, household/unemployed, and retired), were collected. To assess the medical history of patients, the level of hemoglobin A1C (HbA1C, %), type of current treatment (diet and exercise only, insulin injection, oral medication, both injections, and oral medications, and no treatment), and the number of physician visits per year was determined. Diabetes self-care planning was measured using the expanded Summary of Diabetes Self-Care Activities (SDSCA) questionnaires (Mosnier-Pudar *et al.*, 2009). The original expanded SDSCA questionnaire comprised 15 items that measured diabetes self-care activities within the previous week divided into five domains. Accordingly, the patient would mark the number of days the mentioned behavior was performed during the previous week. The SDSCA is divided into the following five domains: diet (three items; score range, 0–21), physical activity (two items; score range, 0–14), blood sugar testing (one item; score range, 0–7), foot care (four items; score range, 0–28), and medication adherence (one item; score range, 0–7). Using this continuous scale ranging between 0 and 7, the numerical scoring of items was based on the number of days a behavior was performed in the week. The mean score of each item was determined to identify the overall score for each self-care activity. Items for the diet and foot care practice scales were reverse-scored (0 = 7, 1 = 6, 2 = 5, 3 = 4, 4 = 3, 5 = 2, 6 = 1, and 7 = 0) because of the low inter-item correlation between the items in the scale as mentioned in the original study. A pilot study was conducted among 20 randomly selected patients with diabetes to determine face and content validity and estimate the time needed for patients to complete the interview. The expert's opinions were then collected, after which the questionnaires were modified. The final questionnaire had a total of 11 items, with a Cronbach's alpha of 0.71 suggesting its validity.

Scoring and measurement

Mean scores for each of the five SDSCA domains were individually calculated, with each item having a score ranging from 0 to 7. For the dietary domain, self-care was classified as adequate when the patient had followed self-care measures more than 70% of the time in a week and inadequate when the patient did not follow self-care measures 70% of the time in a week. Accordingly, a cumulative score was calculated from all three items and converted to a percentage. To calculate the foot care score, a similar concept as in the diet domain was used. The exercise domain was deemed satisfactory when patients engaged in work-related physical activity at least 5 days a week. Diabetes medication adherence was confirmed when patients took the prescribed medications at least 6 days a week.

Statistical analysis

Collected data were analyzed using the IBM SPSS Statistics 22 (IBM Inc., Chicago, IL, USA) and IBM SPSS 22 (IBM Inc., Chicago, IL, USA). Descriptive statistics, such as frequencies and percentages, were used to summarize the data. Mean self-care practice scores were calculated for the SDSCA questionnaires. The association between demographics and SDSCA domains was measured using nonparametric tests. The association between the mean scores and demographics with two groups was assessed using Mann–Whitney U test, while demographics with more than two groups were assessed by Kruskal–Wallis tests. A P value of less than < 0.05 was considered statistically significant.

RESULTS

Table I summarizes the demographic profile of the 402 participants included herein. Among the included participants, 64.4% were male, 36% were female ($n = 143$), 34.3% were aged between 43 and 52 years, and 26.4% were between 52 and 60 years old (Figure-). The Mean age of the participants was 52.39 (SD, 11.01). Majority of the interviewed patients were married 83.6% ($n = 336$), while 73.4% ($n = 295$) received an education (basic

education and above). Approximately 50% (n = 198) were employed, 18.7% were retired, 36.8% were smokers, and more than half of the study participants were alcohol users. Slightly less than half of the respondents had a disease duration of <5 years, while 42.5% had a disease duration of 6–10 years since diagnosis.

TABLE I - Summary of the demographics of respondents (n = 402)

Characteristics	Frequency (n)	Percentage (%)
Sex		
Male	259	64.4
Female	143	35.6
Marital status		
Married	336	83.6
Single	9	2.2
Divorced/separated/ widowed	57	14.2
Education level		
Illiterate	107	26.6
Literate (basic education and above)	295	73.4
Employment status		
Employed	198	49.3
Unemployed	24	6.0
Retired	75	18.7
Self-employed	53	13.2
Housewife	52	12.9

TABLE I - Summary of the demographics of respondents (n = 402)

Characteristics	Frequency (n)	Percentage (%)
Smoking status		
Yes	148	36.8
No	254	63.2
Alcohol status		
Yes	254	63.2
No	148	36.8
Diseases duration		
<5 years	186	46.3
6–10 years	171	42.5
>10 years	45	11.2
Insurance status		
Yes	119	29.6
No	283	70.4

Among the respondents, only 8.7% (n = 35) had followed a healthy eating plan for the entire week, while 33.6% (135) followed a healthy eating plan 6 days per week. Females had better adherence to a healthy eating plan (5.41 ± 0.79 days) compared with males (5.37 ± 0.81 days). More than half of the respondents (n = 230, 57.2%) consumed fruits and vegetables 5 days a week, 14.2% consumed the same foods 6 days a week, and only 2% consumed the same for the entire 7 days. Slightly less than half (n = 184, 45.8%) consumed high-fat, red meat, and dairy products 2 days a week, while 38.6% consumed the same 3 days a week.

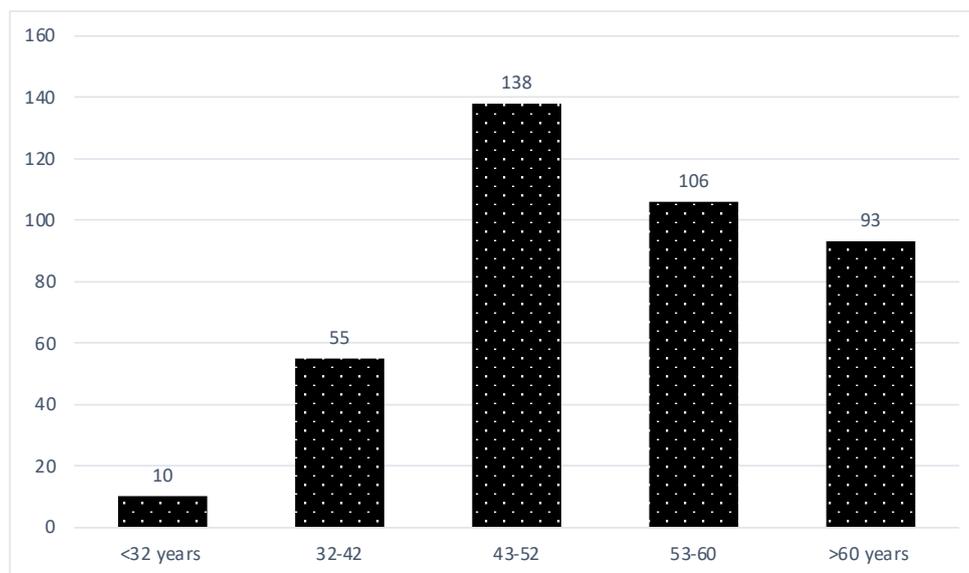


FIGURE 1 - Participants age .

Data obtained herein showed that patients with diabetes had poor self-care planning for physical activity and exercise. Among the respondents, only 9.2% performed 30 minutes of physical activity for each day of the week, while only 5% reported participating in specific exercise sessions for the entire week. Similarly, our results showed very poor self-care planning concerning foot care and blood sugar testing among patients with diabetes in Warangal. Throughout the 7 days included in the questionnaire, only

2.2% (n = 9) of the participants examined their feet 6 days a week, 38.1% inspected their shoes 5 days a week, and only 1.5% washed their feet each day of the week. Moreover, participants demonstrated poor blood sugar testing similar to foot care and physical activity care. Among the respondents, only 9.5% (n = 38) monitored their blood sugar 6 days a week, approximately 33% (n = 132) adhered to their medication 7 days a week, and 22.1% adhered to their medication 6 days a week (Table II).

TABLE II - Details regarding the frequencies at which respondents performed diabetes self-care planning activities

Questionnaires	Days in the past week								Mean (SD)
	0	1	2	3	4	5	6	7	
Diet plan									
How many days did you follow the eating plan?	0	0	0	0	47 (11.7)	185 (46)	135 (33.6)	35 (8.7)	5.39 ± 0.80
How many days did you eat ≥5 servings of fruits and vegetables?	0	0	4 (1.4)	4 (1.4)	99 (24.6)	230 (57.2)	57 (14.2)	8 (2.0)	4.88 ± 0.76
How many days did you consume fatty foods?	2 (0.5)	25 (6.2)	184 (45.8)	155 (38.6)	29 (7.2)	6 (1.5)	-	1 (2.0)	2.51 ± 0.83
Physical activity and exercise									
How many days did you participate in physical activity (30 min)?	1 (0.2)	3 (0.7)	1 (0.2)	9 (2.2)	58 (14.4)	177 (44)	116 (28.9)	37 (9.2)	5.23 ± 1.02
Specific exercise session?	1 (0.2)	1 (0.2)	4 (1.0)	11 (2.7)	78 (19.4)	200 (49.8)	87 (21.6)	20 (5.0)	5.01 ± 0.95

TABLE II - Details regarding the frequencies at which respondents performed diabetes self-care planning activities

Questionnaires	Days in the past week								Mean (SD)
	0	1	2	3	4	5	6	7	
Foot care									
Checked your feet	3 (0.7)	1 (0.2)	12 (3.0)	65 (16.2)	201 (50)	111 (27.6)	9 (2.2)	0	4.06 ± 0.88
Inspecting the inside of your shoes	3 (0.7)	0	5 (1.2)	38 (9.5)	189 (47)	153 (38.1)	13 (3.2)	1 (0.2)	4.30 ± 0.84
Foot washing	0	0	0	24 (6.0)	126 (31.3)	223 (55.5)	23 (5.7)	6 (1.5)	4.65 ± 0.74
Foot soaking	1 (0.2)	4 (1.0)	168 (41.8)	207 (51.5)	14 (3.5)	3 (0.7)	-	5 (1.2)	2.65 ± 0.79
Blood sugar testing									
Blood sugar testing recommended by a healthcare provider	0	1 (0.2)	3 (0.7)	5 (1.2)	97 (24.1)	256 (63.7)	38 (9.5)	2 (0.5)	4.80 ± 0.68
Medication									
Took the prescribed medication?	1 (0.2)	0	0	7 (1.7)	66 (16.4)	107 (26.6)	89 (22.1)	132 (32.8)	5.66 ± 1.17

Our results found that slightly more than half of the respondents (54.5%) had satisfactory scores for diet, while 79.3% obtained a satisfactory overall score for the physical activity domain. Moreover, our findings showed

that respondents exhibited poor total foot care (34%) but good blood sugar testing (73.6%), while their medication adherence score was 55% (Table III).

TABLE III - Satisfactory and unsatisfactory responses to self-care practice

Questionnaires	Satisfactory n (%)	Unsatisfactory n (%)
Diet planning		
How many days over the last 7 days did you follow your eating plan?	355 (88.3)	47 (11.7)
How many days over the last 7 days did you eat ≥ 5 more servings of fruits and vegetables?	295 (73.4)	107 (26.6)
How many days over the last 7 days did you eat high-fat foods, such as red meat or full-fat dairy products?	7 (1.7)	395 (98.3)
Physical activity and exercise		
How many days over the last 7 days did you participate in at least 30 minutes of physical activity?	330 (82.1)	72 (17.9)
How many days over the last 7 days did you participate in a specific exercise session?	307 (76.4)	95 (23.6)
Foot care		
How many days over the last 7 days did you check your feet?	120 (29.9)	282 (70.1)

TABLE III - Satisfactory and unsatisfactory responses to self-care practice

Questionnaires	Satisfactory n (%)	Unsatisfactory n (%)
How many days over the last 7 days did you inspect the inside of your shoes?	167 (41.5)	235 (58.8)
How many days over the last 7 days did you wash your feet?	252 (62.7)	150 (37.3)
How many days over the last 7 days did you soak your feet?	8 (2.0)	394 (98)
Blood sugar testing		
How many days over the last 7 days did you test your blood sugar for the number of times recommended by your healthcare provider?	296 (73.6)	106 (26.4)
Medication		
How many days over the last 7 days did you take your prescribed diabetes medication?	221 (55)	181 (45)

Respondents had an overall SDSCA score of 49.18 ± 3.57 . Our findings showed that the respondents had diet, physical activity, blood sugar testing, foot care, and medication adherence scores of 12.79 ± 1.61 , 10.24 ± 1.77 , 4.80 ± 0.68 , 15.67 ± 1.5 , and 5.66 ± 1.17 , respectively (Table IV).

TABLE IV - Summary of Diabetes Self-Care Activities (SDSCA) data among patients with diabetes mellitus in Warangal, India (n = 402)

Data set (SDSCA)	Value Mean(SD)
Diet score	12.7 ± 1.61
Physical activity	10.24 ± 1.77
Blood sugar testing	4.80 ± 0.68
Foot care	15.67 ± 1.5
Adherence to medication	5.66 ± 1.17
Total score	49.18 ± 3.57

The mean diet, physical activity, blood sugar testing, foot care, and medication adherence scores did not significantly differ according to sex, marital status, smoking status, and alcohol consumption status ($P >$

0.05). However, patients aged 43–52 years old had a higher mean foot care score compared with those in other age categories ($P < 0.001$). Moreover, patients aged 32–42 years old had higher medication adherence and physical activity scores compared with those in the other age groups ($P < 0.001$). Self-employed patients exhibited significantly higher diet and physical activity scores compared with those in the other categories (13.39 ± 1.65 and 11.05 ± 1.63 , respectively; $P < 0.001$). Patients with a disease duration of >10 years had higher diet scores compared with those in the other categories (11.866 ± 1.455 ; $P < 0.001$), whereas those with a disease duration of <5 years had higher physical activity scores compared with those in the other categories (10.41 ± 1.57). Patients with HbA1C levels of $<7.5\%$ had higher mean scores over four self-care domains, except for the foot care domain (15.797 ± 1.477), compared with those with HbA1C levels of $>7.5\%$ levels ($P < 0.001$). Housewives had higher mean scores for blood sugar testing (4.98 ± 0.61) and medication adherence (6.26 ± 0.93) compared with employed and unemployed or retired participants ($P < 0.001$). Furthermore, retired employees showed a higher foot care score (16.14 ± 1.35) compared with employed and unemployed participants and housewives. Detailed information regarding the aforementioned findings is presented in Table V.

TABLE V - Factors associated with the Summary of Diabetes Self-Care Activities domains

Characteristics	Diet Mean(SD)	Physical activity Mean(SD)	Blood sugar testing Mean(SD)	Foot care Mean(SD)	Adherence to medication Mean(SD)
Sex					
Male	12.87 (1.64)	10.27(1.90)	4.79 (0.70)	15.6(1.55)	5.64 (1.20)
Female	12.65 (1.55)	10.19(1.51)	4.83 (0.66)	15.63(1.55)	5.71 (1.12)
<i>P value</i>	0.211	0.479	0.746	0.975	0.652
Age (years)					
<32	13.50 (1.95)	9.80 (2.93)	4.50 (0.70)	16.20 (2.09)	5.50 (1.17)
32–42	13.00 (1.51)	10.94 (1.53)	4.81 (0.77)	15.00 (1.47)	6.00 (1.08)
43–52	12.82 (1.64)	10.28 (1.88)	4.82 (0.74)	15.85 (1.57)	5.79 (1.19)
52–60	12.50 (1.39)	10.05 (1.56)	4.77 (0.66)	15.79 (1.46)	5.46 (1.19)
>60	12.88 (1.80)	10.04 (1.75)	4.83 (0.57)	15.61 (1.50)	5.52 (1.14)
<i>P value</i>	0.126	0.004	0.668	0.014	0.018
Education					
Illiterate	13.44(1.48)	10.78 (1.68)	4.91 (0.58)	15.54 (1.54)	6.252 (0.95)
Literate	12.55(1.60)	10.05 (1.77)	4.76 (0.72)	15.72 (1.55)	5.454 (1.18)
<i>P value</i>	0.000	0.000	0.081	0.281	0.000
Employment					
Employed	12.76 (1.61)	10.12 (1.87)	4.85 (0.61)	15.66 (1.58)	5.72 (1.11)
Unemployed	12.70 (1.89)	10.62 (1.86)	4.50 (0.88)	15.08 (1.93)	5.50 (1.21)
Retired	12.25 (1.47)	9.48 (1.37)	4.65 (0.68)	16.14 (1.35)	4.94 (1.03)
Self-employed	13.39 (1.65)	11.05 (1.63)	4.81 (0.85)	15.64 (1.66)	5.94 (1.33)
Housewife	13.11 (1.40)	10.82 (1.46)	4.98 (0.61)	15.34 (1.23)	6.26 (0.93)
<i>P value</i>	0.000	0.000	0.000	0.013	0.000
Disease duration					
<5 years	12.87 (1.52)	10.41(1.57)	4.85 (0.74)	15.75 (1.57)	5.79 (1.12)
6–10 years	12.94 (1.68)	10.37(1.54)	4.81 (0.59)	15.54 (1.52)	5.81 (1.12)
>10 years	11.86 (1.45)	9.08 (1.32)	4.55 (0.75)	15.82 (1.55)	4.57 (1.05)
<i>P value</i>	0.000	0.000	0.021	0.381	0.000
HbA1C levels					
<7.5%	12.95(1.68)	10.44 (1.77)	4.86 (0.66)	15.54(1.62)	5.94(1.05)
>7.5%	12.64 (1.54)	10.06(1.76)	4.74 (0.71)	15.79(1.47)	5.40(1.22)
<i>P value</i>	0.076	0.014	0.071	0.069	0.000
Body mass index					
Underweight (<18.5)	13.44 (1.54)	11.13 (1.52)	4.88 (0.66)	14.97 (1.72)	5.86 (1.18)
Normal weight (18.51–24.9)	12.68 (1.56)	10.17 (1.75)	4.81 (0.66)	15.73 (1.52)	5.65(1.12)
Overweight (25.00–29.99)	12.74 (1.65)	10.08 (1.83)	4.77 (0.74)	15.84 (1.47)	5.63 (1.26)
Obese (≥30.00)	14.33 (3.21)	9.66 (2.08)	4.00 (0.00)	14.33 (1.52)	5.00 (1.73)
<i>P value</i>	0.028	0.002	0.076	0.013	0.511
Smoking status					
Yes	12.75 (1.70)	10.04 (1.81)	4.77 (0.75)	15.79 (1.62)	5.45 (1.29)
No	12.81 (1.57)	10.36 (1.74)	4.82 (0.64)	15.6 (1.50)	5.79 (1.09)

TABLE V - Factors associated with the Summary of Diabetes Self-Care Activities domains

Characteristics	Diet Mean(SD)	Physical activity Mean(SD)	Blood sugar testing Mean(SD)	Foot care Mean(SD)	Adherence to medication Mean(SD)
<i>P value</i>	0.827	0.123	0.725	0.274	0.013
Alcohol status					
Yes	12.80 (1.64)	10.25 (1.81)	4.77 (0.69)	15.70 (1.53)	5.55 (1.19)
No	12.77 (1.56)	10.22 (1.72)	4.85 (0.67)	15.61 (1.58)	5.86 (1.13)
<i>P value</i>	0.953	0.995	0.352	0.725	0.010
Treatment type					
Insulin injection	15.33 (3.78)	11.66(3.21)	5.66 (1.15)	14.66 (0.57)	5.33(1.15)
Oral medication	12.71(1.61)	10.07 (1.87)	4.76(0.69)	15.67(1.67)	5.63 (1.18)
Injection and tablet	12.74 (1.75)	10.33(1.62)	4.77 (0.83)	15.47 (1.29)	5.55 (1.31)
Diet, exercise, and oral medication	12.90 (1.46)	10.47 (1.63)	4.87(0.53)	15.82 (1.48)	5.79 (1.07)
<i>P value</i>	0.456	0.418	0.291	0.308	0.856
Marital status					
Married	12.79 (1.59)	10.24 (1.83)	4.81 (0.69)	15.68 (1.52)	5.67 (1.20)
Single	12.77 (2.38)	11.11 (1.61)	4.44 (1.23)	14.77 (2.16)	6.00 (0.86)
Divorced/separated	12.68 (1.57)	10.10 (1.59)	4.78 (0.57)	15.89 (1.62)	5.36 (1.12)
Widowed	13.05 (1.71)	10.21 (1.13)	4.89 (0.45)	15.42 (1.57)	5.94 (0.91)
<i>P value</i>	0.813	0.378	0.823	0.407	0.213

DISCUSSION

The lack of self-care planning for diabetes mellitus, and emerging chronic metabolic disease, promotes difficulty in achieving adequate glycemic control, which in turn affects the quality of life of the patient because of the increased disease burden. Given the severe complications associated with diabetes mellitus, as well as the absence of a permanent cure, preventive measures, including self-care planning, play an essential role in achieving adequate glycemic control, reducing associated complications, and helping affected individuals lead a normal life similar to healthy ones.

The findings obtained herein revealed that 63.8% of the participants engaged in diabetes self-care practices, with a total SDSCA score of 49.18 ± 3.5 . Interestingly, these results were better than those presented in earlier national and international studies, with Chali, Salih, Abate, (2018), Selvaraj *et al.* (2016), and Suguna *et al.* (2015) revealing that 54.3%, 46.4%, and 50.5% of

participants had good diabetic self-care practices, respectively. However, our results were consistent with those previously published by Mamo and Demissie, in 2016, (63.2%)²² and Ayele *et al.* in 2012 (60.7%). Nonetheless, the current results were still lower than those presented among Nigerian diabetics who found that 79.5% of respondents engaged in self-care practices (Jackson *et al.*, 2014). Such differences in overall self-care practices might have been due to the use of different study tools, sociocultural differences, limited or lack of access to health care, lack of health education regarding self-care, and differences in educational status among participants.

The current study showed that patients with diabetes had high levels of medication adherence (81.6%) and blood sugar monitoring (73.6%), a finding comparable to that published among south Indians who reported that 95.6% and 82.1% of respondents adhered to their medications and engages in physical activity, respectively (Selvaraj *et al.*, 2016). Similarly, another study among the

Indian community reported that 29%, 19.5%, 70%, and 79.8% of respondents engaged in good dietary practices, exercise, regular blood monitoring, and medication adherence, respectively (Gopichandran *et al.*, 2012). Multiple studies have shown that the most common justification by respondents for poor self-care practices included health education programs, which had a passive effect on better self-care practice; lack of family support; and unavailability of a glucometer at home (Chali, Salih, Abate, 2018).

The present study found that respondents exhibited lower foot care practices (34%) is compared with all other domains, a finding similar to that presented in several previous national and international studies (Selvaraj *et al.*, 2016; Chinnappan *et al.*, 2020; Saleh *et al.*, 2012; Sasi *et al.*, 2013; Ketema *et al.*, 2020). However, our findings were inconsistent that presented by Dedefo *et al.*, (2019) who reported that 82.9% of outpatients with diabetes were more focused on foot care. A similar study by Rajasekharan *et al.* (2015) reported that approximately 71% of respondents washed their feet every day, while another study reported that 64.8% of respondents washed and dried their toes. However, one previous study also reported that an insufficient number of patients performed daily foot examination (28.3%) and inspection of inner shoe surfaces for any discharge (Rajasekharan *et al.*, 2015). The current study found that only 27.6% of the respondents check their feet 5 days a week, while a meager 1.5% and 0.2% performed feet soaking and inspected the insides of their shoes, respectively. These findings were similar to those presented in previous studies conducted among South Indian patients with diabetes (Rajasekharan *et al.*, 2015), within a neighboring country (Saeed, Zafar, Atta, 2010), and within Sri Lanka (Jinadasa, Jeewantha, 2011). Ample evidence suggests that, among the healthy practices performed by patients with diabetes, foot care was the most common given its association with multiple complications, such as foot ulcers, and the subsequent development of a gangrenous lesion that can lead to limb amputations, thereby causing increased burden due to disability. Therefore, awareness regarding self-care is essential in this regard.

The current study found that 79% of the participants engaged in physical activity and exercise, which was

better than that previously reported by Rajasekharan *et al.*, 2015; Dasappa *et al.*, 2017; Amer *et al.*, 2018). Moreover, our results showed a satisfactory 54.5% engagement in healthy eating, which was better than that previously presented by Rajasekharan *et al.* in 2015 (45.9%) among a sample of 290 patients with diabetes, Dasappa *et al.*, (2017) (12.26%), and Gopichandran *et al.*, (2012) (29%). Concerning the components of the SDSCA, a good number of participants exhibited adherence to blood sugar testing and medication. Notably, earlier studies have reported similar findings suggesting a high prevalence of blood sugar testing and medication adherence (Huang, Gorawara-Bhat, Chin, 2005; Dasappa *et al.*, 2017; Gopichandran *et al.*, 2012; Amer *et al.*, 2018; Alhaiti *et al.*, 2020). Similarly, Amer *et al.* in (2018) reported that 64.5% of participants adhered to a healthy diet, while 17.6% adhered to physical activity and exercise. Nonetheless, a previous report also found a lack of adherence to blood sugar testing and foot care practice (Amer *et al.*, 2018), physical activity, dietary advice, and medication (Riaz *et al.*, 2014) indicating that further research aimed at enhancing self-care practice is needed for individuals with diabetes. These discrepancies might have also been influenced by differences in measures used, as well as the living arrangements and characteristics of the respondents. The scores for all instruments were not high perhaps due to the participant's circumstances wherein they needed to visit the hospital for consultation regarding the improvement of health outcomes and reduction of risks associated with disease progression.

In the present study, it was shown that younger participants, were nonsmokers, were nonalcoholic, had a disease duration of 6–10 years, and had HbA1C levels of <7.5% exhibited higher mean scores for medication adherence. Similar results have been reported by earlier studies (Dasappa *et al.*, 2017; Alhaiti *et al.*, 2020), wherein oral medication and a disease duration of 6–10 years were significantly associated with good adherence. Additionally, the current study found that housewives had higher mean scores for blood sugar testing and medication adherence compared with employed participants and those belonging to other categories. No significant difference in the mean scores for all five SDSCA domains had been noted according to sex and

marital status. Additionally, our findings showed that older, retired, and overweight patients had high mean foot care scores. However, Dasappa *et al.*, in (2017) reported no significant association between foot care practice and the socioeconomic status of the population.

CONCLUSION

In the present study, it was shown that respondents had satisfactory self-care management but exhibited poor self-care practices concerning the foot care domain. Moreover, a significant association had been observed between self-care activities and the level of glycemic control. Educational level and treatment type were significantly associated with SDSCA scores. Furthermore, nonsmokers, nonalcoholic, younger participants, and those receiving oral medication had significantly higher mean scores for medication adherence compared with smokers, alcoholics, older participants, and those receiving other treatments. Enhancing adherence to self-care activities through continuous patient education must be considered when creating a diabetes management plan.

CONFLICT OF INTEREST

The authors declare no competing interests

FUNDING

No funding was granted for carrying out this study

REFERENCES

- Alhaiti AH, Senitan M, Dator WLT, Sankarapandian C, Baghdadi NA, Jones LK, et al. Adherence of Type 2 diabetic patients to self-care activity: tertiary care setting in Saudi Arabia. *J Diabetes Res.* 2020;2020:4817637.
- Amer FA, Mohamed MS, Elbur AI, Abdelaziz SI, Elrayah ZA. Influence of self-efficacy management on adherence to self-care activities and treatment outcome among diabetes mellitus type 2. *Pharm Pract (Granada).* 2018;16(4):1274.
- American Association of Diabetes Educators. AADE7 selfcare behaviors. *Diabetes Educ.* 2008;34:4459.
- Ayele K, Tesfa B, Abebe L, Tilahun T, Girma E. Self-care behavior among patients with diabetes in Harari, Eastern Ethiopia: the Health Belief Model Perspective. *PLOS ONE.* 2012;7(4):e35515.
- Chali SW, Salih MH, Abate AT. Self-care practice and associated factors among diabetes mellitus patients on follow up in Benishangul Gumuz regional state public hospitals, Western Ethiopia: a cross-sectional study. *BMC Res Notes.* 2018;11(1):833.
- Chinnappan J, Kp A, Iqbal F, VJ, Ashok P, Varghese RS. Assessment of self-care practices among Type 2 diabetic patients in a secondary care teaching hospital. *J Drug Deliv Ther.* 2020;10(3):119-24.
- Coyle ME, Francis K, Chapman Y. Self-management activities in diabetes care: a systematic review. *Aust Health Rev.* 2013;37(4):513-22.
- Dasappa H, Prasad S, Sirisha M, Ratna Prasanna SVN, Naik S. Prevalence of self-care practices and assessment of their sociodemographic risk factors among diabetes in the urban slums of Bengaluru. *J Family Med Prim Care.* 2017;6(2):218-221. doi: 10.4103/2249-4863.220037.
- Diabetes research and wellness foundation: Understanding diabetes mellitus. Available at <https://www.drwf.org.uk/understanding-diabetes>. Last accessed on November 2, 2021.
- Gopichandran V, Lyndon S, Angel MK, Manayalil BP, Blessy KR, Alex RG, et al. Diabetes self-care activities: a community-based survey in urban southern India. *Natl Med J India.* 2012;25(1):14-7. PMID: 22680314.
- Huang ES, Gorawara-Bhat R, Chin MH. Self-reported goals of older patients with type 2 diabetes mellitus. *J Am Geriatr Soc.* 2005;53(2):306-11. doi:10.1111/j.1532-5415.2005.53119.x.
- Jackson IL, Adibe MO, Okonta MJ, Ukwue CV. Knowledge of self-care among type 2 diabetes patients in two states of Nigeria. *Pharm Pract.* 2014;12(3):404
- Jinadasa CV, Jeewantha M. A study to determine the knowledge and practice of foot care in patients with chronic diabetic ulcer. *Int J Collab Res Intern Med Public Health.* 2011;3(3):115-22.
- Ketema DB, Leshargie CT, Kibret GD, Assemie MA, Alamneh AA, Kassa GM, et al. Level of self-care practice among diabetic patients in Ethiopia: a systematic review and meta-analysis. *BMC Public Health.* 2020;20(1):309.
- Mamo M, Demissie M. Self-care practice and its associated factors among diabetic patients in Addis Ababa Public Hospitals, cross-sectional study. *Diabetes Cholest Metab.* 2016;1(1):2-5.
- McCann A, Backx K, Wasley D, Lindsay J. Self-management behaviour in type 2 diabetes: the role of physical activity. *Diabet Med.* 2010;27(S 1):123.

- Mohandas A, Bhasin SK, Upadhyay M, Madhu SV. Diabetes self care activities among adults 20 years and above residing in a resettlement colony in East Delhi. *Indian J Public Health*. 2018;62(2):104-10.
- Mosnier-Pudar H, Hochberg G, Eschwege E, Virally ML, Halimi S, Guillausseau PJ, et al. How do patients with type 2 diabetes perceive their disease? Insights from the French DIABASIS survey. *Diabetes Metab*. 2009;35(3):220-7. doi:10.1016/j.diabet.2009.02.001.
- Orem, DE. *Nursing Concepts of practice*. (5th edition). St Louis: Mosby Year Book Inc.1995.
- Rahim-Williams B. Beliefs, behaviors, and modifications of type 2 diabetes self-management among African American women. *J Natl Med Assoc*. 2011;103(3):203-15.
- Raithatha SJ, Shankar SU, Dinesh K. Self-care practices among diabetic patients in Anand District of Gujarat. *ISRN Family Med*. 2014;2014:743791.
- Rajasekharan D, Kulkarni V, Unnikrishnan B, Kumar N, Holla R, Thapar R. Self-care activities among patients with diabetes attending a tertiary care hospital in Mangalore Karnataka, India. *Ann Med Health Sci Res*. 2015;5(1):59-64. doi:10.4103/2141-9248.149791.
- Ravi S, Kumar S, Gopichandran V. Do supportive family behaviors promote diabetes self-management in resource limited urban settings? A cross sectional study. *BMC Public Health*. 2018;18(1):826.
- Riaz M, Basit A, Fawwad A, Yakoob Ahmedani M, Ali Rizvi Z. Factors associated with non-adherence to insulin in patients with type 1 diabetes. *Pak J Med Sci*. 2014;30(2):233-9.
- RobatSarpoooshi D, Mahdizadeh M, Siuki HA, Haddadi M, Robatsarpoooshi H, Peyman N. The relationship between health literacy level and self-care behaviors in patients with diabetes. *Patient related outcome measures*. 2020;11:129.
- Saeed N, Zafar J, Atta A. Frequency of patients with diabetes taking proper foot care according to international guidelines and its impact on their foot health. *J Pak Med Assoc*. 2010;60(9):732-5.
- Saleh F, Mumu SJ, Ara F, Begum HA, Ali L. Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetics in Bangladesh: A cross-sectional study. *BMC Public Health*. 2012;12:1112.
- Sadanandam P, Ramagalla AR, Kumar KK, Jha P. Prevalence of DM Mellitus and Risk Factors Among The Employees of NPDCL Warangal. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*.Volume 16, Issue 5 Ver. V (May. 2017), PP 81-87. DOI: 10.9790/0853-1605058187.
- Sasi ST, Kodali M, Burra KC, Muppala BS, Gutta P, Bethanbhatla MK. Self care activities, diabetic distress and other factors which affected the glycaemic control in a tertiary care teaching hospital in south India. *J Clin Diagn Res*. 2013;7(5):857-60.
- Selvaraj K, Ramaswamy G, Radhakrishnan S, Thekkur P, Chinnakali P, Roy G. Self-care practices among diabetes patients registered in a chronic disease clinic in Puducherry, South India. *J Soc Health Diabetes*. 2016;04(1):025-9.
- Shrivastava SR, Shrivastava PS, Ramasamy J. Role of self-care in management of diabetes mellitus. *J Diabetes Metab Disord*. 2013 Mar 5;12(1):14.
- Suguna A, Magal AS, Stany A, Sulekha T, Prethesh K. Evaluation of self-care practices among diabetic patients in a rural area of Bangalore district, India. *Int J Curr Res Acad Rev*. 2015;3(6):415-22.
- Tang TS, Brown M, Funnell M, Anderson R. Social support, quality of life and self-care behaviours among African Americans with type 2 diabetes. *Diabetes Educ*. 2008;34(2):266-76. doi:10.1177/014572170 8315680.
- Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care*. 2000;23(7):943-50.
- Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;27(5):1047-53.

Received for publication on 24th March 2021
Accepted for publication on 29th September 2021