RESEARCH PAPER

Suboptimal Diabetes Self-Management Behaviors and Treatment Satisfaction Among Elderly Rural Patients with Poorly Controlled Type 2 Diabetes and Neuropathy: A Baseline Cross-Sectional Study in Tamil Nadu, India

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ABSTRACT

Background: Diabetes self-management is crucial for elderly patients with type 2 diabetes mellitus (T2DM) in rural India, where prevalence reaches 14-30% among those over 60, often compounded by poor glycemic control (HbA1c >8%) and complications like neuropathy. Suboptimal practices in diet, exercise, foot care, and glucose monitoring persist despite high medication adherence, driven by barriers such as limited healthcare access, low self-efficacy, and sociocultural factors.
Methods: This cross-sectional baseline assessment at a rural Tamil Nadu health center evaluated self-care via the Summary of Diabetes Self-Care Activities (SDSCA) and Diabetes Treatment Satisfaction Questionnaire (DTSQ) among 200 elderly T2DM patients (aged 60-75 years, diabetes duration >5 years, HbA1c >8, neuropathy symptoms with pain score ≥4). Biophysical measures including HbA1c, BMI, and blood pressure were recorded alongside structured questionnaires.
Results: Participants (mean age 66.2 years, 59% male) showed mean HbA1c 8.85% and diabetes duration 10.35 years, with predominant OHA use (82.6%). Medication adherence was high (74%), but compliance was low in foot care (32%), exercise (29%), glucose monitoring (36%), and diet (43%), revealing dissociated behaviors. Treatment satisfaction was moderate-high (87%).
Conclusion: Suboptimal self-management in rural elderly T2DM patients underscores the need for targeted coaching to enhance lifestyle practices, self-efficacy, and monitoring, mitigating complication risks in low-resource settings..

Keywords: Diabetes self-management, elderly T2DM, rural India, glycemic control, neuropathy, self-care behaviors
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INTRODUCTION

Diabetes self-management is crucial for elderly patients with type 2 diabetes mellitus (T2DM) in rural India, where prevalence reaches 14-30% among those over 60, often compounded by poor glycemic control and complications like neuropathy. Suboptimal practices in diet, exercise, foot care, and glucose monitoring persist despite high medication adherence, driven by barriers such as limited healthcare access, low self-efficacy, and sociocultural factors [1,2].

Type 2 diabetes affects over 65 million adults aged 20-79 in India, with elderly rural populations facing heightened risks due to sedentary lifestyles, central obesity, and delayed diagnosis. Studies in Scopus- and PubMed-indexed journals report rural elderly T2DM prevalence up to 30%, with nearly equal male-female distribution and 80% hypertension comorbidity[2,3]. Rural elderly diabetics show dissociated behaviors: 74% adhere to medications but only 29-43% to exercise, diet, foot care, and monitoring, elevating ulceration and cardiovascular risks. Factors include knowledge gaps, time constraints from household duties, resource scarcity, and neuropathy symptoms limiting mobility [1,4,5].

Evidence from Indian and international studies consistently shows that while medication adherence among elderly patients with T2DM is relatively high, lifestyle-related self-care practices such as diet, physical activity, foot care, and self-monitoring of blood glucose are often suboptimal or irregular. These dissociated behavior patterns are influenced by multiple factors, including low self-efficacy, inadequate diabetes-related knowledge, cultural norms, competing household responsibilities, financial constraints, and limited availability of diabetes education and support services in rural areas. In the presence of neuropathic symptoms, reduced mobility and fear of pain may further restrict engagement in physical activity and foot care, thereby increasing the risk of ulceration, infection, and amputation [6,7].

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This cross-sectional baseline assessment at a rural Tamil Nadu health center evaluates self-care via SDSCA and DTSQ among 200 elderly T2DM patients (HbA1c >8%, neuropathy), informing targeted coaching to bridge gaps before interventions. Such efforts align with calls for multifaceted programs enhancing self-efficacy and access in low-resource settings [8,9].

NEED FOR THE STUDY

Diabetes self-management is essential for controlling type 2 diabetes mellitus (T2DM) among elderly rural populations in India, where prevalence reaches 14-30% in those over 60 years. Despite high medication adherence (around 74%), practices like diet (43% compliance), exercise (29%), foot care (32%), and glucose monitoring (36%) remain suboptimal, driven by barriers including limited healthcare access, low self-efficacy, sociocultural factors, and neuropathy symptoms [10]. Type 2 diabetes affects over 65 million Indian adults aged 20-79, with rural elderly facing heightened risks from sedentary lifestyles, obesity, delayed diagnosis, and 80% hypertension comorbidity. Rural prevalence has risen from 1% to 8-10% in recent decades, exacerbated by resource scarcity and uneven healthcare distribution. Elderly patients with poor glycemic control (HbA1c >8%) and neuropathy experience elevated complication risks like ulceration, amputation, and cardiovascular events due to these gaps [11]. Studies confirm dissociated behaviors in rural India: medication adherence exceeds lifestyle practices, influenced by knowledge deficits, financial constraints, family duties, and pain-related mobility limits. Neuropathy negatively impacts self-care scores, while low diabetes knowledge and social support worsen outcomes. Scopus-indexed research highlights urban-rural disparities, with elderly rural diabetics showing poor foot care and exercise due to myths, alternative therapy reliance, and inadequate education [8,10,12]. Current evidence underscores the urgency for baseline assessments in rural Tamil Nadu-like settings to quantify self-care deficits via tools like SDSCA among elderly with HbA1c >8% and neuropathy. Such studies can inform multifaceted coaching interventions enhancing self-efficacy, monitoring, and lifestyle adherence, addressing LMIC gaps where self-management programs are scarce. This cross-sectional evaluation of 200 patients will bridge these voids, guiding pre-intervention strategies to mitigate complications in vulnerable groups [9].

AIM OF THE STUDY

The aim of this cross-sectional baseline study is to assess diabetes self-management behaviors, clinical characteristics, neuropathic complications, and treatment satisfaction among 200 elderly patients (aged 60-75 years) with type 2 diabetes mellitus (T2DM) of over 5 years duration, HbA1c >8%, and symptomatic diabetic neuropathy (pain score ≥4), attending a rural health training center in Tamil Nadu, India. Data collection involves biophysical measurements (HbA1c, BMI, blood pressure), the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire for evaluating adherence to diet, exercise, medication, foot care, and glucose monitoring, and the Diabetes Treatment Satisfaction Questionnaire (DTSQ) to gauge patient perceptions of current management.

METHODOLOGY

Study Design and Setting

This study was designed as a cross-sectional, questionnaire-based survey conducted at the Rural Health Training Centre (RHTC) of Kovai Medical Centre and Hospital (KMCH), located in Vagarayamplayam, Coimbatore, Tamil Nadu. The RHTC serves a predominantly rural population with limited healthcare access, where type 2 diabetes mellitus (T2DM) is highly prevalent and self-management practices are often suboptimal. The present investigation was conceptualized as the baseline phase of a larger diabetes self-management coaching program. However, the current paper focuses exclusively on the pre-test assessment of patients, with the aim of exploring their clinical characteristics, self-care practices, neuropathic complications, and treatment satisfaction prior to any intervention.

Study Population and Eligibility Criteria

The study population consisted of elderly individuals diagnosed with type 2 diabetes mellitus who were attending the KMCH RHTC for routine care. Eligibility was restricted to patients aged between 60 and 75 years, with a documented history of diabetes for more than five years. To ensure that the study focused on individuals with poor glycemic control and increased risk of complications, only those with glycated hemoglobin (HbA1c) levels greater than 8% were included. Furthermore, participants were required to exhibit symptoms suggestive of diabetic neuropathy, confirmed clinically, and to report an average daily neuropathic pain score of four or higher. Both male and female patients meeting these conditions were eligible. Individuals who were unable to comprehend the study questionnaires due to cognitive impairment, severe psychiatric illness, or hearing and speech difficulties were excluded.

Data Collection and Pre-test Assessment

Data were collected using a structured approach that combined clinical examination with standardized questionnaires. Biophysical measures such as height, weight, body mass index (BMI), blood pressure, and HbA1c levels were recorded for all participants. To evaluate diabetes self-care practices, the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire was administered. Finally, treatment satisfaction was measured using the Diabetes Treatment Satisfaction Questionnaire (DTSQ), which provided insight into patients' perceptions of their current management.

Sample Size and Sampling Method

A total of 200 participants were recruited for the pre-test

phase of the study. The sample size was determined based on feasibility and the expected prevalence of poor self-care behaviors among elderly individuals with long-standing diabetes in the rural population. Consecutive eligible patients attending the RHTC during the recruitment period were invited to participate until the target sample was achieved. Written informed consent was obtained from all participants after explaining the objectives and procedures of the study.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee of Kovai Medical Centre and Hospital. Participants were assured of confidentiality, and their data were anonymized prior to analysis. As the current phase of the study involved only non-invasive questionnaires and routine clinical measurements, no additional risks were imposed on the participants.

RESULTS

Age profile of elderly diabetic participants

The age distribution of the study participants indicates that the majority belonged to the younger elderly bracket, with nearly half of the respondents (45.8%) in the 60–64 years age group, followed by 30.3% in the 65–69 years category, and 18.9% aged 70–74 years, while only a small proportion (5.0%) were in the oldest group of 75–80 years. This pattern suggests that the sample was predominantly composed of early elderly individuals, which is consistent with the inclusion criteria restricting age to 60–75 years and may reflect higher healthcare-seeking behavior or clinic attendance among the younger segment of the elderly diabetic population. The approximate mean age of 66.2 years with a standard deviation of 4.6 years, and a median age of about 66 years, further supports a relatively narrow age spread centered around the mid-sixties, indicating a fairly homogeneous age profile within the study sample as shown in Fig. 1 and Table 1.

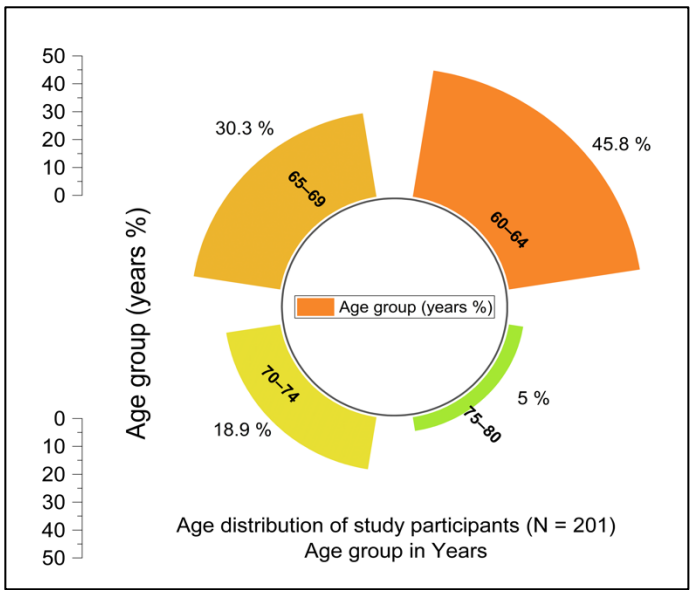

Fig. 1 Circular pie chart depicting the age distribution of study participants

Table 1. Age distribution of study participants (N = 200)

Age group (years)	n (%)
60–64	91 (45.8)
65–69	61 (30.3)
70–74	38 (18.9)
75–80	10 (5.0)
Total	**200 (100)**

Gender Profile of Study Participants

The sex distribution of the study participants reveals a predominance of males, who comprised 59.2% (n = 118) of the sample, compared to females at 40.8% (n = 82), with a total of 200 participants. This gender imbalance may

stem from sociocultural factors in the rural setting, such as greater male clinic attendance for chronic conditions like type 2 diabetes mellitus, potentially influenced by patriarchal family structures where men are prioritized for medical care, or differences in mobility and awareness. Despite the eligibility criteria including both genders without restriction, the observed male majority underscores the need for targeted interventions to enhance female participation in diabetes self-management programs among elderly rural populations.

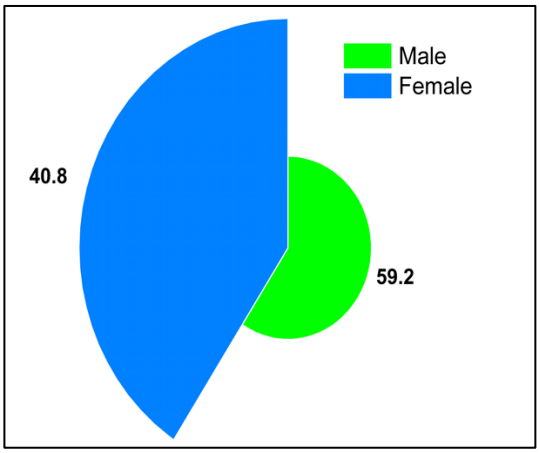

Fig. 2 Donut-style pie chart showing the sex distribution of study participants

Table 2. Sex distribution of study participants (N = 200)

Sex	**n (%)**
Male	118 (59.2)
Female	82 (40.8)
Total	**20 (100)**

Mean age (approx.) = 66.2 ± 4.6 years; Median age ≈ 66 years

Clinical Profile Analysis

The clinical profile of the 200 elderly participants with type 2 diabetes mellitus, all exhibiting HbA1c >8% and neuropathic symptoms, revealed suboptimal glycemic control, with mean HbA1c at 8.85% (SD 1.10%), distributed as 21.0% (n=42) in the 6.5–7.9% range (noting some possible reporting below inclusion threshold), 31.8% (n=64) at 8.0–8.9%, 28.9% (n=58) at 9.0–9.9%, and 17.9% (n=36) at ≥10%. Diabetes duration averaged 10.35 years (SD 2.20), with 42.8% (n=86) having 5–10 years and 56.7% (n=114) over 10 years. Treatment patterns showed reliance on pharmacotherapy, as 35.8% (n=72) used oral hypoglycemic agents (OHA) alone, 46.8% (n=94) combined OHA with diet and exercise, while only 4.0% (n=8) managed with diet alone, 6.0% (n=12) with exercise, and 7.0% (n=14) with alternative medicine; additionally, 53.7% (n=108) reported co-morbidities. These findings underscore prolonged poor glycemic control and predominant pharmacological management in this rural elderly cohort, highlighting needs for enhanced self-management interventions.

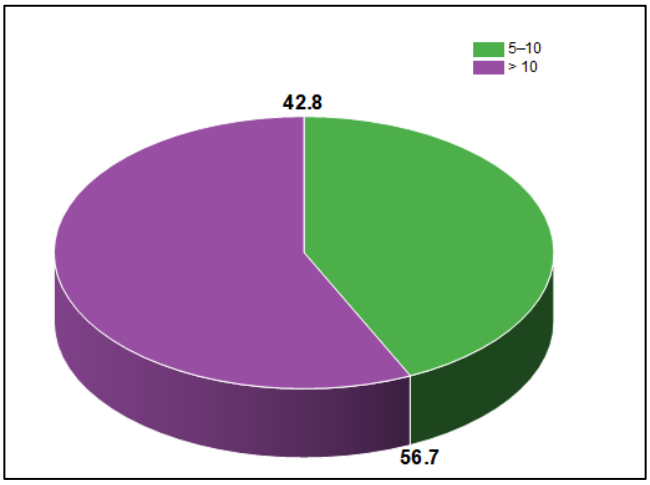

Fig. 3 Pie chart visualizing the duration of diabetes for 200 participants

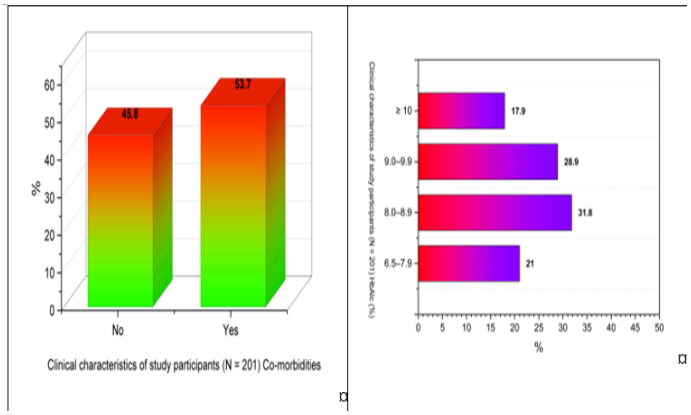

Fig. 4 Clinical characteristics (a) Co-morbidities, (b) HbA1c (%) among 200 participants

Table 3. Clinical characteristics of study participants (N = 200)

Variable	Category	n (%)	Mean ± SD
HbA1c (%)	6.5–7.9	42 (21.0)	
	8.0–8.9	64 (31.8)	
	9.0–9.9	58 (28.9)	
	≥ 10	36 (17.9)	
	Overall	200 (100)	**8.85 ± 1.10**
Duration of diabetes (years)	5–10	86 (42.8)	
	> 10	114 (56.7)	
	Overall	200 (100)	**10.35 ± 2.20**
Type of treatment	Diet control	8 (4.0)	
	OHA	72 (35.8)	
	Physical exercise	12 (6.0)	
	Combination (OHA + diet + exercise)	94 (46.8)	

	Alternative medicine	14 (7.0)	
Co-morbidities	No	92 (45.8)	
	Yes	108 (53.7)	

Mean HbA1c = 8.85 ± 1.10 %
Mean duration of diabetes = 10.1 ± 2.2 years

Behavioral outcomes: self-care practices and treatment compliance

Baseline diabetes self-care compliance among the 200 elderly participants demonstrated substantial variability across behavioral domains, with medication adherence emerging as the most favorable outcome at 74.0% (n=148), while foot care practices exhibited the poorest compliance at only 32.0% (n=64). Diet adherence showed suboptimal compliance, with 57.0% (n=114) of participants demonstrating poor dietary practices, despite dietary modification being a cornerstone of glycemic management in type 2 diabetes mellitus. Exercise adherence presented an even more pronounced deficiency, with 71.0% (n=142) reporting poor compliance with regular physical activity, a critical modifiable risk factor for glycemic control and cardiovascular complications in elderly diabetic populations. Glucose monitoring compliance, recorded at 36.0% (n=72), indicated moderate engagement with self-monitoring practices, which is particularly concerning given that the study cohort consisted of individuals with suboptimal glycemic control (HbA1c >8%). These findings collectively underscore a dissociated pattern of self-care behaviors, wherein participants displayed relative compliance with pharmacological management while demonstrating substantial deficits in lifestyle-based interventions and preventive care practices. The marked low compliance in foot care (68.0% poor compliance) is particularly concerning, as it elevates the risk of diabetic foot complications, including ulceration and amputation, in a population already burdened with neuropathic symptoms.

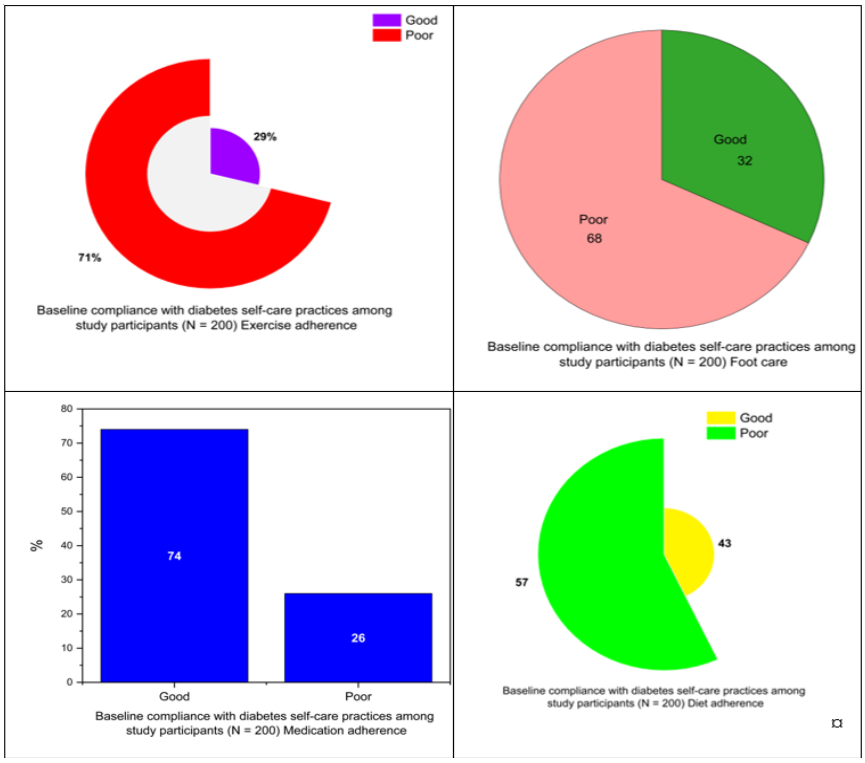

Fig. 5 (a) Exercise adherence, (b) foot care, (c) Medication adherence, (d) Diet adherence-Baseline compliance with diabetes self-care practices among study participants

Table 4. Baseline compliance with diabetes self-care practices among study participants (N = 200)

Variable	Category	n	%
Diet adherence	Good	86	43.0
	Poor	114	57.0
Exercise adherence	Good	58	29.0
	Poor	142	71.0
Medication adherence	Good	148	74.0
	Poor	52	26.0
Foot care	Good	64	32.0
	Poor	136	68.0
Glucose monitoring	Good	72	36.0
	Poor	128	64.0
Treatment satisfaction	High	106	53.0
	Medium	68	34.0
	Low	26	13.0

DISCUSSION

The present study reveals suboptimal diabetes self-care practices among elderly rural T2DM patients with poor glycemic control (mean HbA1c 8.85%) and neuropathy, marked by high medication adherence (74%) but low compliance in foot care (32%), exercise (29%), glucose monitoring (36%), and diet (43%). These patterns align with prior rural Indian findings using SDSCA, where medication and diet adherence exceed exercise and foot care, exacerbated by limited access and sociocultural barriers [13,14]. Poor foot care compliance heightens neuropathy-related risks like ulceration in this cohort (pain score ≥4), consistent with elderly diabetics' elevated amputation vulnerability from neuropathy, deformities, and poor monitoring. Low exercise adherence (71% poor) mirrors rural T2DM challenges, linked to hypoglycemia fear, low self-efficacy, and scarce support, contributing to sustained hyperglycemia [15]. Suboptimal glucose monitoring and diet practices further perpetuate HbA1c >8%, as self-care deficits strongly predict poor control [16–19].

Similar rural Tamil Nadu and Karnataka studies report analogous dissociated behaviors, with urban-rural disparities amplifying non-adherence in elderly via cognitive gaps and resource limits. Treatment satisfaction (53% high) despite gaps suggests pharmacological reliance, underscoring needs for holistic interventions [20,21]. Baseline data advocate targeted coaching for lifestyle domains, enhancing self-efficacy and monitoring to avert complications in rural elderly. Limitations include cross-sectional design and self-reports; future longitudinal phases will assess interventions [21,22].

CONCLUSION

This cross-sectional study highlights suboptimal self-management behaviors among elderly rural patients with type 2 diabetes mellitus, poor glycemic control (mean HbA1c 8.85%), and neuropathy. High medication adherence (74%) contrasted with low compliance in foot care (32%), exercise (29%), glucose monitoring (36%), and diet (43%). These findings reveal a reliance on pharmacotherapy amid deficits in lifestyle practices, increasing risks of complications like foot ulcers in this vulnerable group. They align with prior rural Indian research, emphasizing barriers such as limited access and low self-efficacy. Targeted coaching programs could address these gaps to improve outcomes. The cross-sectional design limits causality inferences, and self-reported data may introduce bias. The sample focused on a specific rural cohort with HbA1c >8%, reducing generalizability. Future longitudinal interventions should prioritize foot care, exercise, and monitoring education for elderly rural diabetics. Integrating family support and community resources may enhance adherence and glycemic control.

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Data Availability: Data will be made available upon request made to the corresponding author.

Patient Consent for Publication: Not applicable.

Competing Interests: All authors confirm that they do not

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have any conflicts of interest to disclose.

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