

Original Research Article

FACTORS INFLUENCING MEDICAL TREATMENT ADHERENCE AMONG NON-COMMUNICABLE DISEASE PATIENTS ATTENDING A TERTIARY CARE HOSPITAL IN THIRUVALLUR

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Received : 26/06/2026
Received in revised form : 22/07/2026
Accepted : 05/08/2026

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DOI: 10.70034/ijmedph.2026.3.924

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 5999-6004

ABSTRACT

Background: Non-communicable diseases (NCDs), mainly hypertension (HT) and diabetes mellitus (DM), are of recent major public concern due to high morbidity and mortality. Poor drug adherence leading to poor control of disease among adults with NCDs is a growing concern. Since only limited researches are available, we aim to study the prevalence and factors influencing adherence to medical treatment among NCD patients.

Objectives: To study the prevalence of adherence to medical treatment and the factors associated with treatment adherence among NCD patients.

Materials and Methods: This cross-sectional analytical study was conducted from Feb 2024 to March 2025 at the NCD clinic of Government Medical College and Hospital, Thiruvallur. Medication adherence was assessed using the 8-item Morisky Medication Adherence Scale (MMAS-8).

Results: Among 375 patients with Diabetes and/or Hypertension, only 258 (68.8%) were adherent to their prescribed medications. In bivariate analysis, education level, duration of disease, presence of chronic complications, knowledge about the disease, transport cost, distance from the health facility, and difficulty in taking multiple drugs were significantly associated with poor drug adherence ($p < 0.05$). In multivariate logistic regression, duration of disease and transport cost were the independent predictors of medication adherence ($p < 0.05$).

Conclusion: Strengthening patient education, optimizing treatment regimens, and improving the accessibility and affordability of NCD care are likely to be key strategies for improving drug adherence in this population.

Keywords: Medication adherence, Morisky Medication Adherence Scale, Diabetes Mellitus, Hypertension, Non-Communicable disease.

INTRODUCTION

The World Health Organization (WHO) defines adherence to long-term therapy as "the degree to which the person's behaviour corresponds with the agreed recommendations from a health care provider."⁽¹⁾ Diabetes and hypertension are highly prevalent Non-Communicable Diseases (NCDs) in India. The National Family and Household Survey (NFHS 6) for 2023 to 2024 data showed that 25.5% of women and 26.3% of men are hypertensives, while diabetes mellitus prevalence among men is

20.9% and among women is 17.8%¹². The prevalence of hypertension was 33.9% and of diabetes was 17.6%, as per the STEPS survey done in 2020 in TamilNadu⁽²⁾ NCD's have been increasing among younger age groups, affecting the economically productive population. Uncontrolled NCD's lead to severe complications like diabetic ulcers, stroke, myocardial infarction, and premature deaths.

Poor medication adherence contributes to poor control, disease progression, complications, prolonged and frequent hospitalizations, and leads to

increased healthcare burden.^[1] Given the rising burden of NCDs and the critical role of treatment adherence in disease management, understanding adherence patterns and their determinants is essential for improving patient outcomes. Since only limited research is available, this study aims to assess treatment adherence and identify factors influencing adherence among NCD patients attending an NCD clinic in a Tertiary Care Centre, Thiruvallur.

Objective

- To study the prevalence of adherence to medical treatment among non-communicable disease patients.
- To study the factors associated with drug adherence among patients with non-communicable disease in a Tertiary Care Centre, Thiruvallur.

MATERIALS AND METHODS

This cross-sectional analytical study was conducted from Feb 2024 to March 2025 at the NCD clinic of Government Thiruvallur Medical College and Hospital, Thiruvallur, Tamil Nadu. The study population comprised adult patients with Diabetes Mellitus (DM) and/or Hypertension (HT) attending the NCD clinic for follow-up care. Eligible participants were patients aged 18–45 years who had been receiving treatment for DM and/or HT for more than six months. Patients with a diagnosed psychiatric illness and those not willing to participate were excluded from the study. The sample size was estimated using the single population proportion formula based on a previously reported prevalence of low medication adherence of 32.7%⁽¹¹⁾, with a 95% confidence level and an absolute precision of 5%. The calculated minimum sample size was 339, which was increased by 10% for non-response rate, resulting in a final sample size of 375 participants. All eligible patients attending the MTM clinic during the study period were recruited through consecutive sampling until the sample size was achieved.

Medication adherence was assessed using the validated 8-item Morisky Medication Adherence Scale (MMAS-8), which categorizes participants into (≥ 6 score) as adherent and (< 6 score) as non-adherent groups based on their total score of 8⁽⁴⁾. Data on socio-demographic characteristics, clinical profile, health-system factors, and behavioural characteristics were collected using a pre-tested semi-structured questionnaire after obtaining approval from the Institutional Ethics Committee of Government Thiruvallur Medical College and Hospital (IEC Approval no: IEC/4/2022; dated: 8.2.2024). Data were analysed using SPSS version 25, with descriptive and inferential statistics and results expressed as proportions. Variables with $p < 0.05$ on bivariate

analysis were analysed using multivariable logistic regression.

RESULTS

A total of 375 patients with Diabetes and/or Hypertension (NCDs) attending the NCD clinic of the tertiary care centre were included in this cross-sectional study. The socio-demographic profile, comorbidity pattern, complication status, level of drug adherence, reasons for non-adherence, and the factors associated with adherence are presented below.

Socio-demographic characteristics

Among 375 study participants, the mean age was 38.0 ± 6.9 years; the majority, 268 (71.5%), were aged above 39 years, while 107 (28.5%) were younger than ≤ 38 years. Of them, 223 (59.5%) were female, and 152 (40.5%) were male. About 256 (68.3%) had studied below the high school level, whereas 119 (31.7%) had completed high school or higher. Most participants, 354 (94.4%), were married and only 21 (5.6%) were unmarried.

With respect to occupation, 173 (43.5%) were unemployed, 93 (27.4%) were semi-skilled workers, 71 (18.9%) were unskilled workers, 34 (9.1%) were skilled workers, and a small proportion were semi-professionals (0.8%) and professionals (0.3%). Based on the BG Prasad socio-economic classification scale (2026)⁵, the largest proportion of participants, 181 (48.3%), belonged to the lower class, followed by 92 (24.5%) in the upper-middle class, 57 (15.2%) in the middle class, 26 (6.9%) in the lower-middle class, and 19 (5.1%) in the upper class. Among them, 225 (60%) belonged to nuclear families, 70 (18.7%) were living alone, 47 (12.5%) belonged to joint families, 23 (6.1%) to three-generation families, and 10 (2.7%) to other family types (Table 1).

Co-morbidity and complications

In 375 study participants, 163 (43.5%) had both diabetes mellitus and hypertension, 108 (28.8%) had hypertension alone, and 104 (27.7%) had diabetes mellitus alone (Table 2). Among them, 37 (9.1%) participants had complications due to non-communicable disease (Table 3).

Prevalence of drug adherence

Overall, 258 (68.8%) of the study participants were found to be adherent to their prescribed medications, while 117 (31.2%) were non-adherent (Figure 1).

Reasons for non-adherence to drugs

Among those 117 (31.1%) non-adherent study participants, most frequently reported reason for non-adherence was forgetting to take drugs during travel or during stress, as mentioned by 101 (86.3%) followed by participants dissatisfaction with treatment control by 90 (76.9%) and lack of knowledge about the disease as reported by 87 (74.3%). This was followed by reasons like increased transport cost 74 (63.2%), presence of acute complications, 69 (58.9%), and distance from

the health facility, reported by 62(58.9%). Long waiting time at the health facility was reported by 44 (37.6%), presence of chronic complications by 37 (31.6%), experiencing side effects of drugs by 27 (23%), difficulty in taking multiple drugs by 26 (22.2%), and difficulty in administering insulin by 17 (14.5%) (Table 4).

Factors influencing drug adherence

On bivariate analysis, education, duration of disease, presence of chronic complications, knowledge about the disease, transport cost, distance from the health facility, and difficulty in taking multiple drugs were significantly associated with drug adherence ($p < 0.05$).

Adherence was significantly higher among participants educated above high school (73.8%) compared with those educated below high school (58.0%) (OR=2.04, 95% CI 1.075–2.508, $p = 0.002$). Participants with a longer duration of disease (> 5 years) showed better adherence (79.1%) than those with a shorter duration (< 5 years) 63.1%, (OR=2.21, 95% CI 1.30–3.18, $p = 0.001$). Adherence was lower among participants with chronic complications (54.1%) compared with those without complications (70.4%) (OR=2.04, 95% CI 1.02–4.01, $p = 0.04$).

Knowledge about the disease showed the strongest association with adherence: 86.0% of participants who were aware of their disease were adherent compared with only 45.6% of those who lacked such knowledge (OR=7.35, 95% CI 4.55–11.87, $p = 0.002$). Adherence was significantly lower among participants who incurred transport cost (50.0%) than among those who did not (73.4%) (OR=2.69, 95% CI 1.64–4.66, $p = 0.01$), and among those living far from the health facility (52.2%) compared with those living near it (27.5%) (OR=3.10, 95% CI

1.79–5.39, $p = 0.001$). Non-adherence was significantly higher among participants who reported difficulty in taking multiple drugs (53.8%) than among those who did not (29.5%) (OR = 2.78, 95% CI: 1.25–6.20; $p = 0.01$).

On multivariate logistic regression analysis, duration of disease greater than 5 years (AOR = 2.06, 95% CI: 1.22–3.50; $p = 0.007$) and transport cost as a barrier (AOR = 2.26, 95% CI: 1.26–4.05; $p = 0.006$) remained independent predictors of medication adherence, whereas education (AOR = 0.62, 95% CI: 0.38–1.00; $p = 0.05$), chronic complications (AOR = 1.66, 95% CI: 0.77–3.53; $p = 0.342$), knowledge about the disease (AOR = 1.61, 95% CI: 0.88–2.95; $p = 0.12$), distance from the health facility (AOR = 0.91, 95% CI: 0.39–2.10; $p = 0.28$), and difficulty in taking multiple drugs (AOR = 1.94, 95% CI: 0.60–7.02; $p = 0.249$) were not independently associated with non-adherence to drugs after adjustment for potential confounders. (Table 5)

Medication Adherence among Study Participants (n=375)

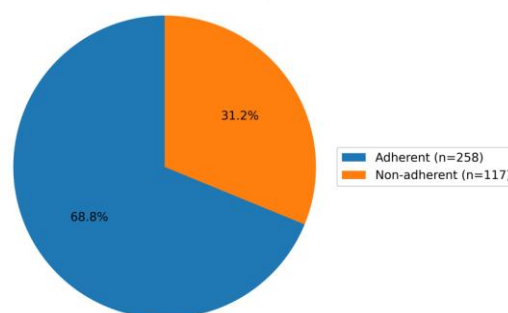


Figure 1: Prevalence of medication adherence among study participants

Table 1: General characteristics of study participants

Factors	Category	Frequency (n=375)	Percentage (%)
Age (in years)	≤38 years	107	28.5
	≥39 years	268	71.5
Gender	Male	152	40.5
	Female	223	59.5
Education	Below high school	256	68.3
	Above high school	119	31.7
Marital status	Unmarried	21	5.6
	Married	354	94.4
Occupation	Unemployed	173	43.5
	Unskilled	71	18.9
	Semiskilled	93	27.4
	Skilled	34	9.1
	Semi professional	3	0.8
	Professional	1	0.3
Socio-economic status (BG Prasad scale 2026)	Upper class	19	5.1
	Upper middle class	92	24.5
	Middle class	57	15.2
	Lower middle class	26	6.9
	Lower class	181	48.3
Type of family	Living Alone	70	18.7
	Nuclear	225	60
	Three generation	23	6.1
	Joint family	47	12.5
	Other types	10	2.7

Table 2: Co-morbidity details of study participants

Non-communicable details	Frequency (n=375)	Percentage (%)
Diabetes mellitus	104	27.7
Hypertension	108	28.8
Both (Diabetes mellitus and Hypertension)	163	43.5

Table 3: Prevalence of complications due to non-communicable disease

NCD Complications	Frequency (n=375)	Percentage (%)
Present	37	9.1
Absent	338	90.9

Table 4: Reasons for non-adherence to drugs among study participants

Factors	Frequency (n=117)	Percentage (%)
Acute complications	69	58.9
Chronic complications	37	31.6
Lack of knowledge about the disease	87	74.3
Forget to take drugs during travel/stress	101	86.3
Difficulty in taking multiple drugs	26	22.2
Experiencing Side effects of drugs	27	23
Transport cost	74	63.2
Difficulty in administering drugs/insulin	17	14.5
Distance from health facility	62	58.9
Long waiting time at health facility	44	37.6
Satisfaction with treatment control	90	76.9

Table 5: Factors influencing drug adherence among study participants (n=375)

Variables	Category	Drug Adherence		Crude OR (95% CI)	p value	AOR (95% CI)	p value
		Non adherent n(%)	Adherent n(%)				
Education	Above high school	67(26.2)	189(73.8)	0.002*	2.04 (1.07-2.5)	0.62 (0.37-1.0)	0.05
	Below high school	50(42)	69(58)				
Duration of disease	<5 years	89(36.9)	152(63.1)	0.001*	2.21 (1.30-3.18)	2.06 (1.21-3.50)	0.007*
	> 5 years	28(20.9)	106(79.1)				
Chronic complication	Absent	100(29.6)	238(70.4)	0.04*	2.04 (1.02-4.01)	1.66 (0.77-3.53)	0.34
	Present	17(45.9)	20(54.1)				
Knowledge about the disease	Absent	87(54.4)	73(45.6)	0.002*	7.35 (4.55-11.87)	1.61 (0.88-2.95)	0.12
	Present	30(14)	185(86)				
Transport Cost	No	80(26.6)	221(73.4)	0.01*	2.69 (1.64-4.66)	2.26 (1.26-4.05)	0.006*
	Yes	37(50)	37(50)				
Distance from health facility	Near	84(27.5)	229(72.5)	0.001*	3.10 (1.79-5.39)	0.91 (0.39-2.10)	0.28
	Far	33(52.2)	29(47.8)				
Difficulty in taking multiple drugs	No	103(29.5)	246(70.5)	0.01*	2.78 (1.25-6.20)	1.935 (0.60-7.02)	0.24
	Yes	14(53.8)	12(46.2)				

DISCUSSION

This cross-sectional study conducted among 375 patients with non-communicable disease attending NCD clinic in tertiary care centre found that 68.8% of participants were adherent to their prescribed medications, while 31.2% were non-adherent. This finding underscores that, although the majority of patients follow their treatment as prescribed, a substantial minority remain at risk of poor disease control, complications, and increased healthcare costs, findings consistent with the World Health Organization's (WHO) observation that medication non-adherence is a major barrier to the effective management of chronic diseases worldwide.⁽¹⁾

Our adherence rate was considerably higher than that reported in a secondary analysis of the WHO Study on Global AGEing and Adult Health (SAGE) wave 2 data from India, which estimated an average NCD medication adherence rate of only 51% among older Indian adults, reflecting substantial non-initiation and non-persistence of treatment.⁽⁶⁾ Similarly, a study among type 2 diabetes patients attending tertiary care hospitals in Mangaluru reported low adherence in 43.5% of participants.⁽⁷⁾ Differences in the adherence-assessment tools may explain such variation across studies and the socio-demographic and health-system context of the study population, reinforcing the WHO's assertion that adherence is a

multidimensional phenomenon shaped by patient-related, therapy-related, health-system-related and socioeconomic factors.⁽¹⁾

In the present study, the most common reasons cited for non-adherence were distance from the health facility (81.6%), dissatisfaction with treatment (76%), and poor knowledge of the disease (57.3%). forgetting to take medications during travel or periods of stress (26.9%), followed by transport cost (19.7%), and acute complications (18.4%). These findings are in line with a qualitative study by Krishnamoorthy et al. on barriers to medication adherence among Indian patients with cardiovascular disease and diabetes mellitus, which identified forgetfulness, cost-related barriers, and inadequate disease-related knowledge as recurring patient-level barriers.⁽⁸⁾ A study evaluating barriers to medication adherence among patients with NCDs similarly reported that a lack of knowledge about the disease and its drugs, as well as financial constraints and transportation costs, were major barriers to adherence,⁽⁹⁾ closely similar to the pattern of non-adherence reasons observed in our study population.

On bivariate analysis, education, duration of disease, presence of chronic complications, knowledge about the disease, transport cost, distance from the health facility, and difficulty in taking multiple drugs were significantly associated with drug adherence. Participants educated above the high-school level were nearly twice as likely to be adherent as those with lower educational attainment. This correlates with the SAGE2 secondary analysis, which identified low educational status as one of the socioeconomic factors that public health interventions to improve medication adherence in India should specifically target,⁽⁶⁾ and is consistent with the WHO's classification of educational attainment as a key component of the socioeconomic dimension of adherence.⁽¹⁾

Participants with longer duration of illness (>5 years) showed significantly better adherence than those more recently diagnosed, and this association persisted on multivariate analysis. A plausible explanation is that patients living with an NCD for a longer period become more familiar with their disease, its complications, and the necessity of continued treatment, and may have already adapted their daily routines to accommodate long-term medication-taking, an interpretation consistent with the WHO's patient-related and condition-related dimensions of adherence, which emphasise that a patient's understanding of, and experience with, the natural history of the disease shapes adherence behaviour over time.⁽¹⁾

Knowledge about the disease showed a strong association with adherence in this study, with nearly six times greater adherence among patients aware of their condition, although this association was attenuated on multivariate analysis. This finding is consistent with a review on the critical role of medicine adherence in the management of chronic

conditions, which identifies patient knowledge and understanding of the disease as a core patient-related determinant within the WHO's five-dimension adherence framework,⁽¹⁰⁾ and with the geriatric patient adherence literature, which similarly emphasises inadequate disease-related knowledge as a modifiable barrier to compliance in patients with chronic illness. These findings collectively support the integration of structured patient education and counselling into routine NCD follow-up visits as a strategy to improve adherence.

Transport cost and distance from the health facility were both significantly associated with poorer adherence in the bivariate analysis, and transport cost remained an independent predictor in the multivariate analysis. These results reflect the health-system and socioeconomic dimensions of the WHO adherence framework¹, wherein cost of travel, distance to the health facility, and limited economic resources are recognised as important structural barriers that can prevent patients from accessing continued care irrespective of their motivation to adhere. Comparable with the study by Fenta et al, distance from residence to the health centre and difficulty in affording travel suggest that geographic and financial accessibility of healthcare is a barrier present across different NCDs and healthcare settings in India.⁽⁹⁾

Difficulty in taking multiple drugs was also significantly associated with non-adherence on bivariate analysis, consistent with the WHO's therapy-related dimension, which identifies regimen complexity as a determinant of adherence behaviour.⁽¹⁾ Patients with more than one NCD, as seen in the 43.5% of our study population with co-existing diabetes mellitus and hypertension, are more likely to be prescribed multiple medications, increasing the complexity of the treatment regimen and the potential reason for missed doses. Similarly, chronic complications were associated with poorer adherence, which may reflect the added treatment burden and psychological distress that accompany complicated disease and correlates with the condition-related dimension of the WHO framework.⁽¹⁾

In multivariate analysis, only duration of disease and transport cost retained statistical significance as independent predictors of adherence, indicating that these socioeconomic and condition-related factors exert an effect on adherence that is not fully explained by the other variables examined. This pattern is consistent with the SAGE2 analysis done by Tolley et al., which concluded that poor medication adherence among NCD patients in India is multifactorial, arising from the interaction of distinct socioeconomic and health-system factors rather than any single determinant in isolation.⁽⁶⁾

These findings of this study suggest that interventions to improve drug adherence among NCD patients attending tertiary care centres should be multipronged, combining structured patient education to improve disease-related knowledge,

optimisation of drug regimens where feasible, and health-system measures to reduce the cost and distance burden of accessing care, such as decentralisation of NCD drug dispensing to peripheral health facilities and the use of reminder-based strategies to address forgetfulness during travel or stress.

Strengths

The strengths of this study include its relatively large sample size, comprehensive assessment of socio-demographic, clinical, and health-system determinants, and the use of the validated 8-item Morisky Medication Adherence Scale (MMAS-8) for measuring medication adherence.

Limitations

As this is a cross-sectional, hospital-based study conducted at a single tertiary care centre, temporal or causal relationships between the identified factors and adherence cannot be established, and the findings may not be generalised to the NCD population who do not access tertiary care. As consecutive sampling was used, selection bias cannot be completely excluded. Adherence was assessed using a self-reported measure, which is subject to recall bias that may overestimate the level of adherence.

CONCLUSION

About two-thirds of NCD patients attending the tertiary care centre were adherent to their prescribed medications. Education level, distance from the health facility, dissatisfaction with treatment, long duration of disease, presence of chronic complications, knowledge about the disease, transport cost, and difficulty in taking multiple drugs were significantly associated with drug adherence, with duration of disease and transport cost emerging as independent predictors. Strengthening patient education, optimising treatment regimens, and improving the accessibility and affordability of NCD care are likely to be key strategies for improving drug adherence in this population.

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