Biomedical & Pharmacology Journal, June 2025. Vol. **18**(2), p. 1389-1394

Evaluating the Impact of Personal Habits on Medication Adherence in Patients with Diabetes Mellitus and Hypertension: A Prospective Cross-Sectional Study

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https://dx.doi.org/10.13005/bpj/3177

(Received: 14 November 2024; accepted: 07 March 2025)

Medication adherence is critical for achieving optimal treatment outcomes and managing chronic conditions such as diabetes and hypertension. Poor adherence can result in severe health complications, increased healthcare costs, and diminished quality of life. This study investigated the influence of personal behaviours, including alcohol consumption, smoking, and fasting, on medication adherence among patients with chronic diseases. Conducted as a cross-sectional study at a tertiary care hospital, it involved 152 participants aged 35 and older with diabetes, hypertension, or both for at least one year. Data were collected using a validated questionnaire and adherence was assessed using the Medication Adherence Rating Scale (MARS-10). Among the participants, 135 were male (88.82%) and 17 were female (11.18%), with the majority aged 50–59 years. Detrimental behaviours, reported exclusively by male participants, included alcohol consumption (34.53%), smoking (13.66%), combined alcohol and smoking use (21.58%), and tobacco use (23.68%). Fasting habits were associated with lower adherence rates, whereas participants who engaged in physical activity generally maintained adherence post-activity. Additionally, the use of over-the-counter medications, common among participants, posed potential risks of interference with prescribed treatments. The findings emphasize the negative impact of alcohol and tobacco use on adherence and the challenges posed by fasting. Targeted interventions addressing these behaviours, along with educational initiatives to improve health literacy and medication management, could enhance adherence and therapeutic outcomes. Further longitudinal studies are recommended to build on these results and explore their broader implications.

Keywords: Alcohol Consumption; Adherence Barriers; Age Influence; Health Literacy; Medication Adherence; Tobacco Compliance.

Medication adherence is critical for patient treatment and achieving clinical goals. Enhancing adherence strategies can benefit population health more than improving individual medical therapies. Adherence includes starting the treatment, following the prescribed regimen, and stopping the medication appropriately. Recognizing the various factors contributing to poor medication adherence is necessary before developing interventions to improve it.[1] Recent studies have identified several factors that may contribute to non-adherence to treatment regimens

among older adults, which include patient-related factors such as age, gender, education level, physical, and cognitive function, and health literacy. The ability of a patient to understand and utilize health information to make responsible choices regarding the treatment they receive is referred to as health literacy. Poor health literacy can make it difficult for patients to understand prescription instructions, leading to missed doses or improper medicine administration.[2]

Medications-related factors are complex regimens, high costs of medications, and unclear instructions. Problems in the patient-provider relationship include dissatisfaction, lack of trust, and limited decision-making involvement. Additionally, challenges within the healthcare system include difficulty accessing pharmacists and other healthcare professionals for their medication-related queries, inadequate follow-up, and substandard care from untrained staff.[3] Drug-related problems are prevalent in chronic diseases due to the presence of multiple health conditions, the use of various medications (polypharmacy), and patients not following their treatment plans.[4] For long-term illnesses like diabetes and hypertension, medication noncompliance can have severe consequences, such as inadequate glycemic control and increased risk of cardiovascular disease and stroke.[5,6] Given the association between medication adherence and adverse outcomes, addressing these issues is crucial for effective disease management.[7] Numerous studies have indicated that drug adherence is influenced by various factors, including forgetfulness and negative thoughts. This article explores how personal behaviours including alcohol consumption, smoking, tobacco use, over-the-counter (OTC) medication use, and fasting impact medication adherence in chronic illnesses. The aim is to investigate the perspectives and behaviors of older adults concerning their medication management routines.

MATERIALS AND METHODS

This cross-sectional study adopted a questionnaire-based approach to assess the influence of personal habits on medication adherence among chronic disease patients. Participants were required to be aged 35 or older with a Confirmed T2DM according to the American Diabetes Association (ADA) criteria, and/or confirmed diagnosis of hypertension according to the American College of Cardiology (ACC) or the American Heart Association (AHA) criteria, with at least a year of disease history. Exclusion criteria included comorbidities other than diabetes and hypertension and refusal to participate. The study was conducted over six months from April 21, 2023, to October 21, 2023, with three months dedicated to data collection and three months for analysis and write-up. Data collection involved a validated questionnaire, developed through a pilot study to ensure reliability and validity. The Medication Adherence Rating Scale (MARS-10) was used to evaluate adherence. Data were analyzed using quantitative and qualitative methods, with statistical analysis performed using Chi-square tests and logistic regression.

Sampling

For our cross-sectional study, we referred previous literatures[8] and used Cochran's formula for estimating a population proportion: n€ = (Z^2 × p × [1 – p]) / d^2. With a 95% confidence level (Z = 1.96), an assumed prevalence of 50% (p = 0.5), and a margin of error of 5% (d = 0.05), the initial sample size (n€) calculated was 384. Since our target population is small (approximately 250 individuals), we applied the finite population correction, which reduced the required sample size to 152 participants. This sample size is sufficient to estimate the prevalence with 5% precision at a 95% confidence level.

Statistical Analysis

Chi-square tests and logistic regression analysis examined the relationship between medication adherence and personal habits. The Chi-square test indicated a significant association (÷² = 12.268, df = 5, p = 0.031), while logistic regression revealed that participants with multiple personal habits were less likely to adhere to their medication regimen (OR = 0.246, 95% CI: 0.082 - 0.737, p = 0.012). Tobacco use was found to significantly lower adherence rates (OR = 0.064, 95% CI: 0.007 - 0.632, p = 0.019).

Ethical and Informed Consent statement

This study was conducted in accordance with the Indian Council of Medical Research (ICMR) National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (2017) and the ethical principles of the Declaration

of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee of SRM Medical College Hospital & Research Centre (Protocol Number: SRMIEC-ST0323-345). Written informed consent was obtained from all participants, and confidentiality was enssured by anonymizing personal identifiers.

RESULTS

Table 1 illustrates the demographic distribution of the study participants, including their age, BMI, and medical conditions. The study involved 152 participants, with 88.82% males and 11.18% females. The average number of participants per age group was 25.99, with a standard deviation of 6.47. BMI categories, the majority were classified as having normal weight (80.26%), followed by overweight (16.45%) and underweight (3.29%). As for medical conditions, 43.42% of participants had T2DM, 25.00% had SHTN, and 31.57% had both T2DM and SHTN.

Out of the 66 patients with diabetes, representing 43.42% of the total patient population, 59 (89.98%) patients were on oral hypoglycemic agents (OHAs) such as sulphonylureas, biguanides either as a single medication or in combination with other medicines and multivitamins. Additionally, 7 (9.91%) patients were using insulin and oral hypoglycemic agents (OHAs). Among the 38 patients with hypertension, which accounted for 25% of the total, 35 (92%) patients were treated with angiotensin-II converting enzyme inhibitors (ACEIs) or calcium channel blockers, while 3 (8%) patients used vasodilators or -adrenergic blockers. Among the 48 patients who had both diabetes and hypertension, 23 (48.31%) patients were being treated with a combination of ACEIs and OHAs.

Among the 152 patients, 48 (31.57%) reported having alcoholic habits, with alcohol-

Table 1. Represents the baseline characteristics of the participants BMI: Body Mass Index, T2DM: Type 2 Diabetes Mellitus, SHTN: Systemic Hypertension

CATEGORY	TOTAL	MALE	FEMALE
Age Distribution			
34-45 Years	34 (22.37%)	30 (22.22%)	4 (23.53%)
46-55 Years	45 (29.61%)	37 (27.41%)	8 (47.06%)
55-65 Years	47 (30.92%)	44 (32.59%)	3 (17.65%)
65+ Years	26 (17.11%)	24 (17.78%)	2 (11.76%)
BMI Categories			
Overweight [25.0—29.9]	25 (16.45%)	24 (17.78%)	1 (5.88%)
Underweight [Below 18.5]	5 (3.29%)	3 (2.22%)	2 (11.76%)
Normal Weight [18.5—24.9]	122 (80.26%)	108 (80.00%)	14 (82.35%)
Medical Conditions			
T2DM	66 (43.42%)	59 (43.70%)	7 (41.18%)
SHTN	38 (25.00%)	30 (22.22%)	8 (47.06%)
Both T2DM and SHTN	48 (31.57%)	46 (34.07%)	2 (11.76%)

Table 2. Medication and Personal Habits Among Patients

Questionnaire	Yes	No
Do you take medication when drinking alcohol?	10.41%	89.58%
Do you ever take medication after smoking?	84.66%	15.30%
Do you take medication after using tobacco?	86.11%	11.11%
Do you have habits of taking OTC/ alternative Medicines?	80.90%	10.50%
Do you take prescribed medicine OTC while taking medicine?	82.90%	17.00%
Do you have fasting habits?	19.73%	80.26%
Do you take medication after fasting?	16.60%	83.33%

Table 3. Medication Adherence Rating Scale (MARS-10) Questionnaire Responses

Questionnaire	No	%	Yes	%
Do you ever forget to take your medication?	48	32%	104	68%
Are you careless at times about taking your medication	54	36%	98	64%
When you feel better, do you sometimes stop taking medication?	71	47%	81	53%
Sometimes if you feel worse when you take the medication, do you stop taking it?	68	45%	84	55%
I take my medication only when I am seeking	68	45%	84	55%
It is unnatural for my mind and body to be controlled by medications?	101	66%	51	34%
My thoughts are clear on medication.	54	36%	98	64%
By staying on medication, I can prevent getting sick.	37	25%	115	75%
I feel weird, like a "zombie" on medication.	116	76%	36	24%
Medication makes me feel tired and sluggish.	86	57%	66	43%

specific queries directed exclusively to male participants. Additionally, 30 (23.68%) patients reported both smoking and alcohol habits, while 13 (8.55%) reported only smoking. 36 (23.68%) patients consumed tobacco, and 6 (8.55%) reported engaging in more than two habits, such as consuming alcohol, smoking, and using tobacco simultaneously. Notably, 19 (12.5%) had no adverse habits. Of the patients, 137 (90%) had these habits for more than three years, 9 (6%) for 2-3 years, 4 (33%) for 3 months to 2 years, and 2 (1%) for 0-3 months. Among the 13 smoking patients, 11 (84.66%) took medication after smoking, and 2 (15.3%) did not. Of the 36 tobacco users, 31 (86.11%) took medication after consuming tobacco, and 5 (11.11%) did not. Additionally, 123 (80.9%) patients took OTC medicines, with 92.6% being male and 7.31% being female. Of the 29 (19.07%) who did not take OTC or alternative medicine, 12 (41.37%) were male and 4 (13.79%) were female. Regarding OTC medicine use, 47 (30.92%) took fever/cold/cough medicine, 5 (3.28%) for pain, 20 (13.15%) for headaches, and 80 (52.63%) took various OTC medicines as needed. Among 122 patients, 102 (97.5%) took OTC medicine alongside prescribed medicine, while 21 (13.8%) did not take prescribed medicine when using OTC medicine. Among 112 patients, 106 (94.64%) said they would take medication after physical activity, while 6 (5.35%) said they would not. Out of 152 patients, 30 (19.73%) had fasting habits (19 males and 11 females), and 122 (80.26%) did not have fasting habits (120 males and 2 females). Among the 30 patients who fasted, 5 (16.6%) would take medication after fasting, and 25 (83.33%) would not. Further details about the Medication and Personal Habits Among Patients are demonstrated in *Table 2.*

MARS-10 Questionnaire

The medication adherence rating scale (MARS-10) questionnaire[9] was used to assess medication adherence among enrolled subjects. The questionnaire contained a total of 10 yes/no questions. From question numbers 1-6, 9 & 10 answer "no," graded with 1, and answer "yes," graded with 0. Questions numbers 7 and 8 answered "yes," graded 1, and the answer "no" was graded 0 as per the scoring suggested by the questionnaire developer. (see Table 3)

DISCUSSION

This study assessed how personal habits influence medication adherence in patients with Type II Diabetes Mellitus and Hypertension through a prospective cross-sectional analysis. In this study, the higher response rate among male patients might be associated with a greater occurrence of detrimental habits like alcohol consumption, smoking, and tobacco use. Most respondents were between 50 and 59, a group commonly encountering significant adherence challenges in managing chronic illnesses.[10]

The high prevalence of both hypertension and diabetes in patients—alongside a notable reliance on ACE inhibitors, calcium channel blockers, and hypoglycemic medications—underscores the complexity of adherence in those

managing multiple chronic conditions. Notably, 48.31% of patients have been prescribed ACE inhibitors in combination with oral hypoglycemic medications.[11]

However, the findings here suggest that a large segment of patients (80.9%) also reported chronic use of OTC or alternative medicines, primarily for non-specific ailments such as pain or colds, with a concerning 97.5% of these individuals combining OTC drugs with prescribed medications. This frequent mixing of unsupervised medications poses a substantial risk of drug interactions, underscoring the importance of addressing this trend through patient education[12]. Furthermore, detrimental habits appear to play a significant role in adherence barriers: 34.53% of males consumed alcohol, while 13.66% smoked, and 21.58% engaged in both smoking and tobacco use.[13] Although only a small fraction (10.41%) combined medication with alcohol, a high percentage (86.11%) continued their medication despite tobacco use. These findings highlight the need to incorporate education on substance use within adherence interventions, especially given the risks associated with alcohol and diabetes medications, such as hypoglycemia with sulfonylureas.[14]

The challenge of balancing medication schedules with fasting was also evident. A small group (19.73%) reported fasting practices, and among these, 16.60% adjusted their medication timing post-fast. This variation emphasizes the importance of advising patients on safe medication practices during fasting or other lifestyle changes, particularly with medications that require consistent timing or food intake.[15]

Interestingly, a large proportion of participants took their medication after physical activity, indicating an integration of adherence within their health routines. However, further research is warranted to assess whether physical exertion affects adherence consistency or medication efficacy.

The measure showed good reliability and validity across two long-term conditions: diabetes and hypertension. MARS-10 performed well among chronic patients, with good internal consistency (Cronbach's alpha 0.86) across illness groups.[16]

Adherence challenges in older patients—often due to polypharmacy, cognitive issues, and diverse health beliefs—were further evidenced here. Patients reported perceived side effects, such as fatigue and "zombie-like" feelings (76%), as key concerns. These findings highlight the challenges of managing medication adherence in patients with chronic conditions, especially when influenced by personal habits, the use of over-the-counter medications, and lifestyle practices such as fasting and physical activity. Patient-centred education that addresses these aspects may be crucial for improving adherence and supporting better long-term health outcomes.

Limitation

Although the sample size is sufficient for certain analyses, it may not accurately represent the heterogeneous population of individuals with chronic illnesses. Additionally, the disproportionately high number of male participants may bias the results and limit their generalizability. As the study relies solely on self-reported data from questionnaires, there is a potential for recall and social desirability biases to be introduced.

CONCLUSION

This cross-sectional study evaluated the impact of personal behaviors on medication adherence among patients with type 2 diabetes mellitus and hypertension. Our findings indicate that detrimental habits—particularly tobacco use—were significantly associated with reduced adherence, as demonstrated by logistic regression analysis. In addition, a notable proportion of patients concurrently used over-the-counter medications alongside prescribed therapies, raising concerns about potential drug interactions. The study also highlighted challenges related to lifestyle factors such as fasting and suboptimal physical activity, which may further complicate effective medication management. These results underscore the need for targeted, patient-centred interventions—particularly educational strategies addressing substance use and safe medication practices—to improve adherence and ultimately enhance clinical outcomes in this high-risk population.

ACKNOWLEDGEMENT

The authors sincerely thank SRM Medical College Hospital & Research Centre, SRMIST for providing all the resources.

Funding Sources

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The author(s) do not have any conflict of interest.

Data Availability Statement

This statement does not apply to this article.

Ethics Statement

This research did not involve human participants, animal subjects, or any material that requires ethical approval.

Informed Consent Statement

This study did not involve human participants, and therefore, informed consent was not required.

Clinical Trial Registration

This research does not involve any clinical trials

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Not Applicable.

Author Contributions

Study Conceptualization, Formal analysis and Supervision: Jagadeesan M; Data curation software handling and analysis were performed by Pavithra V and Mohammed Fayaz S; The first draft of the manuscript was written by Pavithra V, and Jeevak Chander T.R Reviewing and editing done by Jagadeesan M

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