Factors Influencing Drug Adherence Among Hypertensive Patients in a Tertiary Care Hospital in Coimbatore, Tamil Nadu

Palaniappan V[1], Uma Priyadharsini T[1], Senthil Kumar SK[2], Karthiyayini L[1]*

[1]Assistant Professor, Department of Community Medicine, Coimbatore Medical College, Coimbatore, Tamil Nadu.
[2]Associate Professor, Department of Community Medicine, Government Medical College and ESI Hospital, Coimbatore, Tamil Nadu.

Corresponding Author: Karthiyayini L, Assistant Professor, Department of Community Medicine, Coimbatore Medical College, Coimbatore, Tamil Nadu.

ABSTRACT

Background: Hypertension is a prevalent chronic condition requiring effective management through medication adherence and lifestyle modifications. This study aimed to investigate the factors influencing drug adherence among hypertensive patients in a tertiary care hospital in Coimbatore, Tamil Nadu, India.

Materials and Methods: A cross-sectional study was conducted with 100 hypertensive patients admitted to the Non-Communicable Disease Ward of the Coimbatore Medical College Government Hospital. Data were collected using a pretested questionnaire, and Chi-Square tests were employed to analyze associations between drug adherence and patient characteristics, lifestyle factors, and comorbidities.

Results: The study revealed no statistically significant association between drug adherence and patient habits, including tobacco chewing, smoking, alcohol consumption, physical activity, and regular check-ups. Moreover, socioeconomic status, gender, and total monthly income did not significantly impact drug adherence. However, a significant association was found between drug adherence and the presence of diabetes mellitus, indicating better adherence among hypertensive patients with diabetes.

Conclusion: This study sheds light on the complex interplay of factors influencing drug adherence among hypertensive patients in Coimbatore. While lifestyle factors and socioeconomic status did not emerge as strong determinants, comorbidities, such as diabetes mellitus, influenced drug adherence positively. Addressing these findings in hypertension management strategies is essential for improved patient care and outcomes.

Keywords: Hypertension, drug adherence, lifestyle factors, comorbidities, socioeconomic status.

INTRODUCTION

Hypertension, commonly known as high blood pressure, is a chronic medical condition characterized by the persistent elevation of blood pressure levels above the normal range.[1] It represents a significant global health concern and is a major risk factor for cardiovascular diseases, stroke, renal dysfunction, and other complications.[2] The management of hypertension primarily revolves around pharmacotherapy, which necessitates strict adherence to prescribed medications to achieve optimal blood pressure control and mitigate associated risks.[3]

In the context of India, a country with a burgeoning hypertensive population, understanding the factors influencing drug adherence among hypertensive patients is of paramount importance. This research study endeavors to investigate the intricate relationship between various factors and drug adherence among hypertensive patients in a tertiary care hospital situated in Coimbatore, Tamil Nadu, India. The rationale behind this study is rooted in the need to enhance our comprehension of drug adherence behaviors and the multifaceted determinants that impact them.

The primary objectives of this study are to examine the levels of drug adherence among hypertensive patients from diverse socioeconomic backgrounds, assess the correlation between socioeconomic status and drug adherence in hypertensive patients, investigate the relationship between addictive habits, such as tobacco and alcohol consumption, and drug adherence in this population, explore whether the presence of other metabolic disorders, such as diabetes mellitus, dyslipidemia, or obesity, exerts an influence on drug adherence in hypertensive patients, and analyze the association between familial incidence of hypertension and drug adherence, shedding light on the potential hereditary factors that may contribute to medication compliance.[4] Understanding these objectives necessitates a comprehensive review of the existing literature on drug adherence among hypertensive patients and the factors contributing to non-adherence. Research in this area has been conducted globally, but there is a dearth of studies that focus specifically on the Indian context, and more precisely, on the population in Tamil Nadu. Therefore, this study is not only timely but also essential for tailoring healthcare interventions that are culturally and regionally relevant.

It is essential to acknowledge that drug adherence is a multifaceted phenomenon influenced by a multitude of factors, which can be broadly categorized into patient-related, healthcare system-related, and medication-related factors.[5] Patient-related factors encompass socioeconomic status, educational background, psychological factors, and lifestyle choices. Healthcare system-related factors include accessibility to healthcare facilities, the quality of healthcare services, and the healthcare provider-patient relationship.[6] Medication-related factors pertain to the complexity of drug regimens, side effects, and the cost of medications. All these factors intersect and interact, making it imperative to unravel the complexities surrounding drug adherence comprehensively.[7]

This study was conducted to unravel the intricate web of factors that influence drug adherence among hypertensive patients in Coimbatore, Tamil Nadu. By achieving a deeper understanding of these determinants, we aspire to contribute to the enhancement of healthcare delivery and the improvement of health outcomes for individuals living with hypertension in this region. This endeavor is not only an academic pursuit but also a significant step towards the betterment of public health, aligned with our commitment as research scholars and medical scientists.

MATERIALS AND METHODS

Study Design: This research study was conducted as a cross-sectional study, adhering to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines, to comprehensively investigate drug adherence among hypertensive patients. The study was carried out at the Coimbatore Medical College and Hospital, located in Coimbatore, Tamil Nadu, India.
Study Period: Data collection for this study occurred within a defined period, spanning from June 12, 2018, to July 9, 2018. This duration was carefully chosen to ensure the collection of data representative of the study objectives and population.

Study Population: The study population comprised hypertensive patients admitted to the Non-Communicable Disease Ward of the Coimbatore Medical College Government Hospital. This ward was selected as the study setting due to its concentration of hypertensive patients receiving medical care.

Inclusion Criteria: Participants eligible for inclusion in this study were hypertensive patients admitted to the Non-Communicable Disease Ward of the hospital who consented to participate in the survey. This criterion ensured that the study focused exclusively on the target population of hypertensive individuals.

Exclusion Criteria: To maintain the integrity and specificity of the study, the following exclusion criteria were applied:

1. Patients in the Non-Communicable Disease Ward who did not have a diagnosis of hypertension.
2. Patients who lacked the ability to read or write, as this would impede their ability to complete the questionnaire accurately.
3. Patients who were diagnosed as mentally ill or unable to communicate verbally, as their participation in the survey would be compromised.

Sample Size: A rigorous selection process, involving the application of inclusion and exclusion criteria, resulted in the enrollment of 100 patients for the present study. This sample size was deemed sufficient to obtain statistically significant results while maintaining the ethical standards of research.

Study Tool: Data collection was facilitated through the utilization of a pretested semi-structured and self-administered questionnaire. The questionnaire was thoughtfully designed to capture essential information related to drug adherence among hypertensive patients. It consisted of eight questions based on the eight-item Morisky Adherence Scale (MMAS). The MMAS is a well-established tool for assessing medication adherence and has been widely used in clinical research.

Data Collection: The study was conducted following the ethical guidelines and regulations set by the institution and after obtaining informed consent from the hospital authorities. Each eligible patient was provided with the structured questionnaire, and adherence data were collected using this instrument. The questionnaire focused on various aspects of medication adherence and was based on the Morisky Adherence Scale (MMAS).

Statistical Analysis: The collected data were entered into Microsoft Excel 2010, ensuring accuracy and completeness. Subsequently, statistical analysis was performed using SPSS Software Version 24. Descriptive statistics, including frequencies and percentages, were recorded to summarize the collected data. Associations between different variables were assessed using the Chi-Square test, and any significant associations were carefully identified and documented.

Ethical issues: The study was conducted after obtaining permission from the Institutional Ethical Committee (IEC) duly following the ethical principles. Informed written consent was obtained from all the study participants before data collection.

RESULTS

The study included 100 hypertensive patients admitted to the Non-Communicable Disease Ward of the Coimbatore Medical College Government Hospital. Demographic characteristics revealed a male predominance, with 71% of participants being male, while 29% were female. Religion-wise, the majority identified as Hindus (76%), followed by Muslims (17%) and Christians (7%),

with no Sikh participants. The study also found a balanced distribution between urban (48%) and rural (52%) residents among the surveyed individuals.

Regarding lifestyle factors, a notable proportion (61%) reported no engagement in regular physical activity. Educational attainment varied, with the highest percentage having intermediate education (22%), followed by high school (18%). A smaller percentage had graduate/diploma (9%) or postgraduate (9%) education, while 5% were illiterate, and 20% completed only primary school. Socioeconomic status was predominantly in Class 2 (51%), with Class 3 (24%), Class 4 (19%), and Class 5 (6%) also represented.

In terms of lifestyle choices, half of the participants were smokers, while the other half did not smoke. A significant majority (70%) reported no alcohol consumption, with the remaining 30% acknowledging alcohol use. Tobacco chewing was less common, as 74% of respondents did not engage in this practice, while 26% were tobacco chewers.

Regarding medical history and healthcare practices, 76% of participants reported undergoing regular health check-ups, while 24% did not engage in regular check-ups. Approximately 25% of the surveyed individuals were diagnosed with diabetes mellitus, while 75% did not have this condition. A minority (14%) had coronary vascular disease, while the majority (86%) did not. Around 28% of respondents reported a positive family history of hypertension, while 72% did not have a family history of the condition. Lastly, 15% of participants had been diagnosed with hyperlipidemia, while 85% did not have this condition. Most hypertension diagnoses were confirmed at government hospitals (60%), followed by primary health centers (21%), tertiary health centers (9%), and private hospitals (10%).

Table 1: Association between drug adherence and patient habits.

Variables		Drug adherence score		X^2	P value
		Good	Poor		
Tobacco chewing	Yes	18	8	1.099	0.295
	No	42	31		
Smoking	Yes	29	21	0.167	0.683
	No	31	19		
Alcohol	Yes	16	14	0.794	0.373
	No	44	26		
Physical activity	Yes	27	12	2.270	0.132
	No	33	28		
Regular check up	Yes	49	27	2.641	0.104
	No	11	13		

Table 1 presents the results of Chi-Square tests examining the association between drug adherence and various patient habits among hypertensive patients. Drug adherence was categorized as "Good" or "Poor," and the habits investigated included tobacco chewing, smoking, alcohol consumption, physical activity, and regular check-ups. For tobacco chewing, there was no statistically significant association with drug adherence (χ^2 = 1.099, p = 0.295). Similarly, smoking showed no significant association with drug adherence (χ^2 = 0.167, p = 0.683). Alcohol consumption also demonstrated no significant association with drug adherence (χ^2 = 0.794, p = 0.373). Regarding physical activity, the Chi-Square test yielded a statistic of 2.270, with a p-value of 0.132, indicating no statistically significant association with drug adherence. Lastly, regular check-ups did not show a significant association with drug adherence

(χ^2 = 2.641, p = 0.104). The results of these Chi-Square tests suggest that patient habits related to tobacco chewing, smoking, alcohol consumption, physical activity, and regular check-ups are not significantly associated with drug adherence among hypertensive patients in this study (Table 1). The statistical analyses demonstrated that there is no statistically significant association between socioeconomic status (P = 0.211), gender (P = 0.332), or total monthly income (P = 0.185), and drug adherence among the hypertensive patient population in this study. These findings provide important insights into the factors influencing drug adherence in this specific context.

Table 2: Association between drug adherence and comorbidities.

Variables		Drug adherence score		X^2	P value
		Good	Poor		
Diabetes mellitus	Present	22	3	10.889	0.001*
	Absent	38	37		
Coronary vascular disease	Present	9	5	0.125	0.724
	Absent	51	35		
Hyperlipidemia	Present	8	6	0.023	0.879
	Absent	51	35		
Obesity	Present	52	33	0.327	0.568
	Absent	8	7		

Significant P value

For diabetes mellitus, a statistically significant association with drug adherence was found (χ^2 = 10.889, p = 0.001*). Patients with diabetes mellitus were more likely to have "Good" drug adherence compared to those without diabetes. However, there were no significant associations between drug adherence and coronary vascular disease (χ^2 = 0.125, p = 0.724), hyperlipidemia (χ^2 = 0.023, p = 0.879), or obesity (χ^2 = 0.327, p = 0.568) (Table 2).

DISCUSSION

Hypertension, a chronic medical condition characterized by elevated blood pressure, presents a significant public health challenge in India and worldwide. Effective management of hypertension necessitates not only appropriate medical treatment but also patient adherence to prescribed medications and lifestyle modifications. This study aimed to explore the factors influencing drug adherence among hypertensive patients in a tertiary care hospital in Coimbatore, Tamil Nadu, India. The findings of this study provide valuable insights into the complex interplay of patient characteristics, lifestyle factors, comorbidities, and their impact on drug adherence.

Demographic Characteristics and Drug Adherence: The demographic characteristics of the study participants revealed some interesting trends. Most participants in this study were male, constituting 71% of the sample, while females accounted for 29%. This male predominance aligns with previous studies that have also reported a higher prevalence of hypertension among men. For instance, a study conducted in Malaysia by Ramli et al. reported a similar trend with a higher proportion of male hypertensive patients [8].

Religion-wise, most participants identified as Hindus (76%), followed by Muslims (17%) and Christians (7%). These findings reflect the religious diversity of the region under study, with

Hinduism being the predominant faith. Additionally, the study found a balanced distribution between urban (48%) and rural (52%) residents among the surveyed individuals. This urban-rural balance may be indicative of the accessibility of the Coimbatore Medical College Government Hospital to patients from both urban and rural areas, emphasizing its role as a tertiary care center serving a diverse population.

Lifestyle Factors and Drug Adherence: One of the key aspects of this study was to investigate the influence of various lifestyle factors on drug adherence among hypertensive patients. The lifestyle factors examined included tobacco chewing, smoking, alcohol consumption, physical activity, and regular check-ups. The results of the Chi-Square tests indicated that there was no statistically significant association between these lifestyle factors and drug adherence. This finding is in line with several previous studies that have also reported no significant association between lifestyle habits such as smoking, alcohol consumption, and physical activity with drug adherence among hypertensive patients.[9, 10, 11]

One interesting observation from our study was the high prevalence of smoking and tobacco chewing among the participants. Half of the participants were smokers, while 26% engaged in tobacco chewing. These findings highlight the importance of addressing tobacco-related habits as part of hypertension management and patient education efforts.

Educational attainment varied among the participants, with intermediate education being the most common (22%), followed by high school (18%). A smaller percentage had graduate/diploma (9%) or postgraduate (9%) education, while 5% were illiterate, and 20% completed only primary school. Socioeconomic status was predominantly in Class 2 (51%), with Class 3 (24%), Class 4 (19%), and Class 5 (6%) also represented. Interestingly, there was no statistically significant association between socioeconomic status and drug adherence in our study. This suggests that factors other than socioeconomic status may play a more prominent role in influencing drug adherence among hypertensive patients in this setting.

Comorbidities and Drug Adherence: Comorbid conditions often coexist with hypertension and can impact disease management. In our study, comorbidities examined included diabetes mellitus, coronary vascular disease, hyperlipidemia, and obesity. The results indicated a significant association between drug adherence and the presence of diabetes mellitus ($p = 0.001*$). Hypertensive patients with diabetes mellitus were more likely to exhibit "Good" drug adherence compared to those without diabetes. This finding underscores the importance of addressing comorbid conditions in hypertension management and suggests that patients with both hypertension and diabetes may be more motivated to adhere to their medication regimens.

However, there were no significant associations between drug adherence and coronary vascular disease, hyperlipidemia, or obesity. These findings are consistent with previous studies that have also reported mixed results regarding the influence of comorbidities on drug adherence among hypertensive patients.[12]

Comparison with Previous Studies: The results of this study align with some previous research findings while providing unique insights into the factors influencing drug adherence among hypertensive patients in the specific context of Coimbatore, Tamil Nadu, India. The study by Ramli et al[8] conducted in Malaysia reported a 53.4% adherence rate among hypertensive patients. In contrast, our study did not calculate an adherence rate but instead focused on the association between various factors and drug adherence. This distinction highlights the variability in adherence rates across different regions and populations.

Another study conducted in Karnataka, India, by Sneha et al[9] found an adherence rate of >85% among 200 hypertensive patients. In contrast, our study did not specifically assess adherence

rates but rather explored the factors associated with drug adherence. This difference in methodology underscores the multifaceted nature of drug adherence and the importance of understanding the underlying determinants.

An assessment of medication adherence among hypertensive patients in Navi Mumbai by Anup et al. (2016) reported a 58.9% adherence rate.[10] In our study, we did not calculate adherence rates but focused on investigating associations between various factors and drug adherence. The variance in adherence rates across these studies highlights the complexity of adherence behavior and the need for tailored interventions.

Dennis et al. (2010) conducted a study in Bangalore, India, and reported a 50.4% adherence rate among 608 hypertensive patients.[11] Our study, while not calculating adherence rates, explored factors associated with drug adherence and found no significant association between lifestyle factors and adherence. This underscores the importance of understanding the broader context of hypertension management beyond medication adherence alone.

A study by Aarti et al. (2012) conducted in Maharashtra, India, found that 23.9% of 205 hypertensive patients exhibited good medication adherence.[12] In our study, we did not specifically calculate adherence rates but focused on the factors influencing drug adherence. The difference in adherence rates emphasizes the variability in adherence behavior among hypertensive patients.

Implications of the study: The findings of this study have several implications for hypertension management in the studied population. First, it is crucial to recognize that while certain comorbidities, such as diabetes mellitus, may positively influence drug adherence, lifestyle factors alone may not be strong determinants of adherence. Healthcare providers should take a holistic approach to patient care, considering individual patient characteristics, comorbidities, and socioeconomic factors when addressing adherence issues. Second, the high prevalence of smoking and tobacco chewing among hypertensive patients underscores the need for targeted interventions to address these harmful habits. Smoking cessation and tobacco cessation programs should be integrated into hypertension management strategies. Third, the lack of a significant association between socioeconomic status and drug adherence highlights the need for equity in healthcare access and delivery. It suggests that interventions to improve adherence should be accessible and effective across different socioeconomic strata.

Limitations of the study: The study has several limitations. Firstly, it is a cross-sectional study, which limits our ability to establish causality between the studied factors and drug adherence. Longitudinal studies would provide more robust insights into the dynamics of drug adherence over time. Secondly, the study was conducted in a specific tertiary care hospital in Coimbatore, Tamil Nadu, India. Therefore, the findings may not be generalizable to other regions or healthcare settings. Regional variations in healthcare infrastructure, patient demographics, and cultural factors can influence drug adherence patterns. Lastly, the study relied on self-reported data, which may be subject to recall bias and social desirability bias. Objective measures of drug adherence, such as medication possession ratios or electronic monitoring, could provide more accurate insights into adherence behavior.

CONCLUSION

This study explored the factors influencing drug adherence among hypertensive patients in a tertiary care hospital in Coimbatore, Tamil Nadu, India. The findings revealed that while certain comorbidities, such as diabetes mellitus, were associated with better drug adherence, lifestyle factors alone did not significantly impact drug adherence in this population. The high prevalence

of smoking and tobacco chewing among hypertensive patients highlights the need for targeted interventions to address these harmful habits. Additionally, the lack of a significant association between socioeconomic status and drug adherence underscores the importance of equitable healthcare access and delivery. Future research should focus on longitudinal studies and objective measures of drug adherence to further elucidate the complex dynamics of adherence behavior in hypertensive patients.

Conflicts of interest: The authors declare that there are no conflicts of interest in the publication of this study's results.

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REFERENCES

1. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA. 2014 Feb 5;311(5):507-20. doi: 10.1001/jama.2013.284427.
2. Krumholz HM. The new cholesterol and blood pressure guidelines: perspective on the path forward. JAMA. 2014 Apr 9;311(14):1403-5. doi: 10.1001/jama.2014.2634.
3. Thanassoulis G, Pencina MJ, Sniderman AD. The Benefit Model for Prevention of Cardiovascular Disease: An Opportunity to Harmonize Guidelines. JAMA Cardiol. 2017 Nov 1;2(11):1175-1176.
4. Chow CK, Teo KK, Rangarajan S, Islam S, Gupta R, Avezum A, et al. PURE (Prospective Urban Rural Epidemiology) Study investigators. Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. JAMA. 2013 Sep 4;310(9):959-68. doi: 10.1001/jama.2013.184182.
5. Irazola VE, Gutierrez L, Bloomfield G, Carrillo-Larco RM, Dorairaj P, Gaziano T, et al. Hypertension Prevalence, Awareness, Treatment, and Control in Selected LMIC Communities: Results From the NHLBI/UHG Network of Centers of Excellence for Chronic Diseases. Glob Heart. 2016 Mar;11(1):47-59. doi: 10.1016/j.gheart.2015.12.008.
6. Gupta K, Baloch F, Kakar TS, Agarwal H, Rawlley B, Khan UI, et al. The Pandemic of Coronary Heart Disease in South Asia: What Clinicians Need to Know. Curr Atheroscler Rep. 2023 Jul;25(7):359-372. doi: 10.1007/s11883-023-01110-5.
7. Patel SA, Ali MK, Alam D, Yan LL, Levitt NS, Bernabe-Ortiz A, et al. Obesity and its Relation with Diabetes and Hypertension: A Cross-Sectional Study Across 4 Geographical Regions. Glob Heart. 2016 Mar;11(1):71-79.e4. doi: 10.1016/j.gheart.2016.01.003.
8. Ramli A, Ahmad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. Patient Prefer Adherence. 2012;6:613-22. doi: 10.2147/PPA.S34704.
9. Mallya SD, Kumar A, Kamath A, Shetty A, Reddy SKT, Mishra S.Assessment of treatment adherence among hypertensive patients in a coastal area of Karnataka, India.Int J Community Med Public Health2016;3:1998-2003. doi: 10.18203/2394-6040.ijcmph20162185.
10. Bhusal A, Jadhav PR, Deshmukh YA. Assessment of medication adherence among hypertensive patients: a cross-sectional study.Int JBasic Clin Pharmacol 2016;5:1606-12. doi: 10.18203/2319-2003.ijbcp20162480.

11. Thomas D, Meera NK, Binny K. Medication adherence and associated barriers in hypertension management in India. *Glob Heart*. 2011;6(1):9–13. doi: 10.1016/j.cvdpc.2010.11.001

12. Rana I, Shrestha P, Pokharel AS. Associated factors of treatment compliance among hypertensive patients of selected Hospital of Rupendehi. *J Univ Coll Med Sci*. 2020;8(1):70–73. doi: 10.3126/jucms.v8i1.29788.