



available at www.sciencedirect.com



journal homepage: www.elsevierhealth.com/journals/precon



Medication adherence and associated barriers in hypertension management in India

Dennis Thomas ^{a,1}, N.K. Meera ^a, K. Binny ^{b,*}, M. Sonal Sekhar ^{a,2},
Githa Kishore ^a, Salini Sasidharan ^c

^a Department of Pharmacy Practice, Visveswarapura Institute of Pharmaceutical Sciences, Bangalore, India

^b Melmaruvathur Adhiparasakthi Institute of Medical Sciences & Research, Melmaruvathur, Tamilnadu, India

^c Department of Ophthalmology, Vinayaka Missions Kirupananda Variyar Medical College, Salem, Tamilnadu, India

Received 7 September 2010; received in revised form 15 November 2010; accepted 24 November 2010

KEYWORDS

Medication adherence;
Hypertension control;
Brief medication
questionnaire

Summary

Hypertension is inadequately controlled in most patients due to poor adherence to treatment. Not much is known about the underlying reasons for poor adherence. The main objective of this study was to assess medication adherence in hypertensive patients and to identify the main barriers associated with medication adherence. A questionnaire-based survey was conducted in the medicine outpatient department of Kempe Gowda Institute of Medical Sciences and Research Centre, Bangalore, India. Self reported adherence was measured by using a short validated questionnaire and detailed patient interviews. Of the 608 patients participated, non-adherence was found in 49.67% of patients. Belief barrier was reported in 39.14% patients. Access barrier and recall barrier were reported by 82.57% and 62.17%, respectively. 78.62% of patients reported that it is difficult to pay for the medication and 54.93% indicated that it is difficult to get a refill on time. It was concluded that about half of the Indian patients studied were not adherent to their antihypertensive regimen and this might result in poor blood pressure control. Non-adherence to hypertension management remains a major limiting factor

* Corresponding author. Address: TC 25/576, Housing Board Jn.,
Thampanoor, Thiruvananthapuram, Kerala 695001, India. Tel.: +91
9949833055; fax: +91 40 66511536.

E-mail addresses: dennispt2@gmail.com (T. Dennis), meera_satish@yahoo.com (N.K. Meera), drbinnyk@gmail.com (K. Binny), ask4sonal@yahoo.co.in (M.S. Sekhar), ngkishore@gmail.com (G. Kishore), drsalinis@gmail.com (S. Sasidharan).

¹ Present address: Global Medical Affairs, Dr. Reddy's Laboratories Ltd., Hyderabad, Andhra Pradesh, India.

² Present address: Department of Pharmacy Practice, Amrita School of Pharmacy, Kochi, Kerala, India.

among Indians in the effective control of hypertension and in the prevention of cardiovascular diseases.

© 2010 World Heart Federation. Published by Elsevier Ltd. All rights reserved.

Introduction

Hypertension is one of the main causes of cardiovascular mortality and morbidity. Data on the global burden of hypertension show that more than a quarter (26.4%) of the adult population had hypertension in 2000 and this is projected to increase by about 60% (1.56 billion) by 2025. The burden of hypertension is almost double in economically developing countries compared to developed countries [1]. Blood pressure is inadequately controlled in most hypertensives. Low adherence to antihypertensive treatment, a universal phenomenon, is proposed to be one of the reasons for blood pressure not meeting JNC-VII goals [2]. Even though effective treatments are available for hypertension, more than half of the patients being treated discontinue their medications entirely within a year of diagnosis and, of those who remain under medication only about 50% take at least 80% of their prescribed medication [3]. As a result of poor adherence to antihypertensive regimens, approximately 75% of patients with a diagnosis of hypertension do not attain optimum blood pressure control [3]. Adherence is defined as the extent to which a person's behavior coincides with medical or health advice. The adherence rate is worse in chronic conditions compared to acute conditions and drops very abruptly after 6 months of treatment in chronic conditions [4].

Adherence involves, not only taking the prescribed medications, but also compliance with follow up appointments and maintaining the suggested lifestyle modifications [5]. Krousel-Wood et al. reported that factors that influence adherence include patient demographics, side effects of medication, convenience of drug dosing, cost and number of medications, patients' knowledge, beliefs and attitude about hypertension and its treatment, patients' involvement with their care and health care system issues. Similarly, asymptomatic existence and lifelong nature of hypertension are two other key factors that undoubtedly contribute to poor patient adherence to drug regimens [6].

Physicians also may contribute to patients' poor adherence by prescribing complex drug regimens, not explaining adequately the benefit and risks of a medication, not giving consideration to the patient's life style or the cost of medication, and not having an effective therapeutic relationship with their patients. Although there are many studies conducted on adherence in India, studies aimed at finding out the reasons of non-adherence in hypertension management are few. The authors felt the need for conducting a study since we believed that reasons for non-adherence to hypertension management would be different in India, as the socioeconomic conditions in India are different from those existing in the West. This study was aimed at assessing adherence to antihypertensive therapy and the major barriers associated with medication adherence that include patients' access, beliefs and recall barriers in an Indian urban population. This study would enable doctors to improve hypertension management with a better understanding of

the barriers leading to non-adherence. This would also help them to ensure effective adherence for proper management of hypertension.

Materials and methods

The present study was conducted from December 2008 to May 2009 at the Internal Medicine outpatient department of Kempe Gowda Institute of Medical Sciences (KIMS) and Research Centre, Bangalore, India. Hypertensive adults of either sex having a treatment history of at least 6 months were included in the study. Pregnant women, patients unable to attend the interview, patients not willing to give informed consent and patients having severe complications including coronary artery disease and end organ damage were excluded from the study. Patients found eligible were randomly selected from the outpatient department register using a computer generated randomization chart. If any of the eligible patients was not willing to participate in the study, the subsequent patient was enrolled. All enrolled patients were interviewed by the investigator and were administered a pre-tested, validated adherence questionnaire. Patient's response was recorded in the questionnaire. Treatment history, history of hypertension and relevant medical history were recorded. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured and recorded. Mean arterial pressure (MAP) was also calculated.

The study was conducted after obtaining approval from the institutional ethics committee and all ethical principles were followed during the entire study.

Brief medication questionnaire

Self reported non-adherence was measured by using a validated questionnaire named Brief Medication Questionnaire (BMQ), and by detailed patient interviews [7]. BMQ included four screens i.e., regimen screen, belief screen, recall screen and access screen. Regimen screen indicates self reported non-adherence with current drug regimen and belief screen shows the presence of negative beliefs or motivational barriers regarding efficacy, bothersome side effects, and other concerns related to the treatment regimen. Recall screen captures the potential difficulties in remembering the dosage schedule whereas, access screen denotes the difficulties in paying for and refilling medication.

The regimen screen contains five questions regarding a patient's behavior of taking medications and each question carries one point. A score of ≥ 1 indicates presence of non-adherence. This screen is designed to measure only the presence or absence of self reported non-adherence. The extent of non-adherence was not measured. Remaining three screens contain two questions each with one point for each question. A total score of ≥ 1 in any of these screens indicated the existence of that barrier.

Data analysis

Data were analyzed using SPSS version 11.0 (SPSS Inc., Chicago, IL, USA) statistical software. All four screens were measured separately. Associations between different variables were analyzed using Chi-square test. Student's *t* test was used to evaluate the difference in quantitative variables between groups. Logistic regression with odds ratio estimation was used to evaluate predictors of adherence. A significance level of $p < 0.05$ was used in the analyses.

Results

Altogether 608 hypertensive patients were enrolled in the study. There were 312 (51.32%) males and 296 (48.68%) females, and 33.55% of patients belonged to 51–60 age group. The mean age was 58.40 years. With regards to the education status, 542 (89.14%) patients had not studied beyond a high school level education. One hundred and twenty patients (19.74%) had a hypertension history of less than one year duration at enrollment in the study. Nearly half (47.70%) of the study participants were diagnosed within the last two years prior to the enrollment. Demographic details of the study participants are described in Table 1.

Regimen screen

In the present study 306 (50.33%) patients were adherent to their antihypertensive therapy. It shows that about half of the participants were not taking antihypertensive medications as prescribed. This might be contributing to the inadequate blood pressure control. In the present study,

hypertension was controlled in 54 (8.88%) patients. Of these 54 patients, 48 patients were adherent to antihypertensive treatment. There was a significant ($p < 0.001$) association between hypertension control status and adherence in the study participants. Non-adherent patients had a higher chance of uncontrolled hypertension compared to adherent patients (Odds Ratio 9.18; 95% CI of 2.70–31.19). There was a significantly ($p < 0.01$) low SBP, DBP and MAP in patients who were adherent to hypertension management (Table 2).

Belief barrier

Belief barrier was present in 39.14% of patients. Patients believed that either their medications are not working (37.82%) or their medications will bother them (5.92%).

Access barrier

Access barrier was reported by 82.57% of patients of which 78.62% patients reported that is difficult to pay for medication and 54.93% of patients mentioned that it is difficult to get refills on time.

Recall barrier

Recall barrier was present in 62.17% of patients.

Regression analysis

Logistic regression analysis showed that the educational level was not contributing to non-adherence (Odds Ratio 0.75, 95% CI of 0.64–0.87) unlike duration of hypertension, which showed a significant ($p = 0.031$) contributory effect to non-adherence. The observed odds ratio was 1.06 (95% CI of 1.01–1.11). There was no significant difference in the number of antihypertensive medications or total medications being prescribed between adherent and non-adherent patients. Chi square analysis showed no association between the adherence pattern and the number of antihypertensive medications being prescribed.

Belief barrier evaluates the barriers of the patient's belief about the effectiveness of the medications being administered as well as the patient's attitude towards hypertension management. We evaluated the effect of belief barrier on MAP. There was a significantly less ($p = 0.007$) MAP in patients without belief barrier in comparison to patients with belief barrier.

Access barrier indicates the opinion of patients about the difficulties in getting refills on time and patient's unwillingness or inability to pay for medication. We evaluated whether patients who expressed access barrier were getting more medications than those who did not have access barrier. There was no statistically significant difference in the total number of antihypertensive medications or other medications being consumed between patients who had access barrier and who did not have access barrier.

In recall barrier, 36.84% patients opined that they were finding it difficult to remember all prescribed doses. We evaluated the role of number of antihypertensive medications (irrespective of frequency of administration) and total number of tablets on recall barrier. For a patient receiving

Table 1 Demographics of study population.

Demographic	Number of patients	Percentage
<i>Age in years</i>		
30–40	24	3.95
41–50	122	20.07
51–60	204	33.55
61–70	170	27.96
71–80	88	14.47
<i>Sex</i>		
Male	312	51.32
Female	296	48.68
<i>Education</i>		
No education	240	39.47
Primary	24	3.95
Secondary	132	21.71
High school	146	24.01
PUC/diploma	30	4.93
Degree and above	36	5.92
<i>Hypertension since</i>		
<1 year	120	19.74
1–2 years	170	27.96
3–5 years	150	24.67
6–10 years	74	12.17
>10 years	94	15.46

Table 2 Hypertension characteristics according to adherence.

	Adherent (<i>n</i> = 306) Mean ± SD	Non-adherent (<i>n</i> = 302) Mean ± SD	Significance
Duration of hypertension (years)	3.40 ± 4.02	4.53 ± 5.79	0.049
Systolic BP (mm Hg)	151.80 ± 20.51	163.40 ± 21.45	0.000
Diastolic BP (mm Hg)	92.34 ± 12.28	96.81 ± 11.82	0.001
Mean arterial pressure (mm Hg)	112.16 ± 13.45	119.01 ± 13.56	0.000

Table 3 Medication details based on difficulty in remembering pills.

	Difficulty absent (<i>n</i> = 384) Mean ± SD	Difficulty present (<i>n</i> = 224) Mean ± SD	Significance
Number of antihypertensive medications prescribed	1.42 ± 0.54	1.39 ± 0.74	0.693
Number of tablets consumed daily	1.84 ± 0.85	3.27 ± 1.27	0.000

multiple antihypertensive drugs with a different frequency of administrations, we considered the total number of tablets the patient consumed daily as drug intake for that particular patient. There was no statistically significant difference in the number of antihypertensive medications being administered between patients with and without recall barrier. Total number of tablets consumed daily was significantly ($p < 0.001$) less in patients who did not face difficulty in remembering the pills to be consumed, in comparison to those who faced such difficulty (Table 3).

Discussion

Our intention was to find out whether non-adherence is contributing to a poor clinical response in hypertensives and if so, the reasons/barriers causing non-adherence to hypertension management in Indian patients. Hypertension management often requires dose titration and simultaneous use of multiple agents based on periodical blood pressure assessments. Before modifying the treatment, health care provider should ensure that a patient is adhering to the prescribed hypertensive medications. Non-adherence has been previously reported as a contributory factor in inadequate hypertension control [8]. There is no gold standard method for measuring adherence. Clinicians can find out the patient's adherence by asking simple questions e.g. how many days was the medication taken/missed? Hypertension management should include programs to improve patient's adherence to the medication also.

In the present study we found that the achievement of BP goal (as per JNC 7 recommendations) was very low compared to previous studies [9,10]. Patients who were non-adherent to treatment showed 9.18 times chance to have uncontrolled hypertension compared to those adherent to hypertension treatment. We found that hypertension control was associated with adherence to treatment.

We also observed that educational level had no impact on the adherence pattern. This is contradictory to the common belief that better educational levels improve adherence to treatment. We could observe that the duration of hypertension was related to non-adherence, with patients showing non-adherence had longer duration of hypertension compared to adherent patients.

This study also reveals the main reasons/barriers associated with non-adherence. It was observed that the main reason associated with non-adherence was access barrier. Several studies have revealed that in developing countries the main reason associated with medication non-adherence is difficulty in paying for the medication. Buabeng et al. reported that an unaffordable drug price is the main reason for non-adherence in 96% of patients in Ghana [11]. In our study, most of the patients reported that they found it difficult to pay for their medication and more than half of the patients said that it is difficult to get a refill on time. We had neither evaluated the economic status of the study participants nor the cost of drugs being prescribed. Hence we cannot comment whether the economic status or cost of medication prescribed had influence on access barrier. But we evaluated the number of drugs being given and the total number of tablets being consumed daily in both patients with or without access barrier. There was no significant difference in the number of drugs prescribed or number of tablets being taken. This shows that number of medication prescribed or frequency of administration had no influence on the access barrier. Clinicians can overcome access barrier by prescribing less costly drugs and advising patients to refill their medication before it gets finished.

Recall barrier was the second commonly observed reason for non-adherence. Patients who reported recall barrier were getting more tablets per day compared to others, even though the number of drugs was not significantly different. Recall barrier is an important factor that can lead to non-adherence if the patient is prescribed multiple drugs with different frequency of administration. In hypertension management, which is often a long term affair, drugs will be changed during the course of treatment and new drugs may be introduced. This would lead to difficulty in remembering the doses and time of administration. This can be minimized by optimizing the number of drugs being administered by titrating according to the therapeutic response and by simplifying the dosage schedules by including once daily administrations, whenever possible.

Belief barrier indicates the patients' beliefs and attitude towards the treatment being administered. Patients with belief barrier had the concern that either their medications were not working or that their drugs would cause adverse events. Health care providers should spend time

in reassuring patients and explaining to them the benefits and risks of their hypertensive medications. This would improve the therapeutic relationship between physicians and their patients. Additionally, this would help to convince patients about the need to consume the prescribed medications without fail. A cost-effective treatment regimen should be adopted based on the patient's affordability and drug availability and efforts should be made to minimize the number of tablets consumed daily.

Limitations of the study

This study has a few limitations. In this study we did not assess the financial status of patients or the cost of medications prescribed. We need further studies to evaluate the cost-effectiveness of prescribed treatment regimes and their role on the adherence pattern observed in hypertension. Availability of prescribed medications at patients' locations was also not recorded in this study. These limitations might have contributed to the access barrier observed in this study. Since our intention was to identify the barriers to hypertension management in hypertensive patients attending the OPD in the study centre, this was designed as an observational study and we did not try to include patients with equal educational status to balance out the chance of education backgrounds influencing adherence to treatment. Finally, this study was not conducted as a prospective study and hence the effect of visit schedule on adherence could not be ascertained.

Conclusion

In this study, we found a poor adherence status among the study participants. The results were very different from those of earlier published studies conducted in developed countries. Difficulty in paying for medication and difficulty in remembering doses and time of administration were the most cited reasons for non-adherence. These reasons may differ from region to region. Since this study was conducted in a hospital where people belonging to different economic strata avail medical care in a metropolitan city in India, these results are applicable only to the scenario in Indian cities. Access to medications is better in Indian cities compared to rural areas. Hence, it should be assumed that compliance to treatment may be still worse among hypertensive patients in rural areas. In conclusion, non-adherence to hypertension management remains a major limiting factor among Indians in the effective control of hypertension and in the prevention of cardiovascular diseases.

Perspective

Practitioners should always bear in mind that lack of efficacy need not always be limited to medications alone. They should also consider the 'patient factor' in terms of their adherence to prescriptions. Hence, all efforts should be placed to evaluate the adherence of patients to treatment regimes before modifying the prescriptions in patients with uncontrolled hypertension. Treatment of hypertension needs a comprehensive management plan including patient

counseling, identification of cost-effective drugs affordable to patients, creating patient awareness about the benefits and risks of medications, and tailor-made regimens to reduce pill burden. Such a multi-directional approach would be required to ensure adequate control of hypertension.

Disclosures

There is no conflict of interest with respect to financial or professional interests for any of the authors listed. All authors have contributed either during study design or during the conduct or during the manuscript preparation and approval.

Financial support

There was no financial support/grant for this study.

Acknowledgements

We are grateful to Ms. Bonnie L Svarstad, Ms. Betty A Chewning, Ms. Betsy L Sleath and Ms. Cecilia Claesson for kindly granting us permission to use the Brief Medication Questionnaire.

References

- [1] Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005;365:217–23.
- [2] Giverhaug T, Falck A, Eriksen BO. Effectiveness of antihypertensive treatment in chronic renal failure: to what extent and with which drugs do patients treated by nephrologists achieve the recommended blood pressure? *J Hum Hypertens* 2004;18:649–54.
- [3] World Health Organization. Adherence to long term therapy: evidences for action. Switzerland: World Health Organization; 2003, p. 107–112.
- [4] Osterberg L, Blaschke T. Adherence to Medication. *N Engl J Med* 2005;353:487–97.
- [5] Joshi M, Rao BS, Khan GM. Study of drug use in essential hypertension and their compliance. *Kathmandu Univ J Sci Eng Technol* 2006;2:1–13.
- [6] Krousel-Wood M, Thomas S, Muntner P, Morisky D. Medication adherence. A key factor in achieving blood pressure control and good clinical outcomes in hypertensive patients. *Curr Opin Cardiol* 2004;19:357–62.
- [7] Svarstad BL, Chewning BA, Sleath BL, Claesson C. The Brief Medication Questionnaire: a tool for screening patient adherence and barriers to adherence. *Patient Educ Couns* 1999;37:113–24.
- [8] Al-Sowielem LS, Elzubier AG. Compliance and knowledge of hypertensive patients attending PHC centres in Al- Khobar, Saudi Arabia. *East Mediterr Health J* 1998;4:301–7.
- [9] Rosário TM, Scala LC, França GV, Pereira MR, Jardim PC. Prevalence, control and treatment of arterial hypertension in Nobres – MT. *Arq Bras Cardiol* 2009;93:622–8.
- [10] Rayner B, Schoeman HS. A cross-sectional study of blood pressure control in hypertensive patients in general practice (the I-TARGET study). *Cardiovasc J Afr* 2009;20:224–7.
- [11] Buabeng KO, Matowe L, Plange-Rhule J. Unaffordable drug price. The major cause of non-compliance with hypertension medication in Ghana. *J Pharm Pharm Sci* 2004;7:350–2.