Patient Preference and Adherence

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ORIGINAL RESEARCH

Medication adherence among hypertensive patients of primary health clinics in Malaysia

This article was published in the following Dove Press journal:
Patient Preference and Adherence
30 August 2012
Number of times this article has been viewed

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Purpose: Poor adherence to prescribed medications is a major cause for treatment failure, particularly in chronic diseases such as hypertension. This study was conducted to assess adherence to medications in patients undergoing hypertensive treatment in the Primary Health Clinics of the Ministry of Health in Malaysia. Factors affecting adherence to medications were studied, and the effect of nonadherence to blood pressure control was assessed.

Patients and methods: This was a cross-sectional study to assess adherence to medications by adult patients undergoing hypertensive treatment in primary care. Adherence was measured using a validated survey form for medication adherence consisting of seven questions. A retrospective medication record review was conducted to collect and confirm data on patients' demographics, diagnosis, treatments, and outcomes.

Results: Good adherence was observed in 53.4% of the 653 patients sampled. Female patients were found to be more likely to adhere to their medication regime, compared to their male counterparts (odds ratio 1.46 [95% confidence intervals [CI]: 1.05–2.04; $P < 0.05$]). Patients in the ethnic Chinese were twice as likely (95% CI: 1.14–3.6; $P < 0.05$) to adhere, compared to those in the Indian ethnic group. An increase in the score for medicine knowledge was also found to increase the odds of adherence. On the other hand, increasing the number of drugs the patient was taking and the daily dose frequencies of the medications prescribed were found to negatively affect adherence. Blood pressure control was also found to be worse in noncompliers.

Conclusion: The medication adherence rate was found to be low among primary care hypertensive patients. A poor adherence rate was found to negatively affect blood pressure control. Developing multidisciplinary intervention programs to address the factors identified is necessary to improve adherence and, in turn, to improve blood pressure control.

Keywords: medication compliance, blood pressure control, primary care

Introduction

Hypertension or high blood pressure is defined as having persistent, elevated systolic blood pressure of 140 mmHg or above and/or diastolic blood pressure of 90 mmHg or above.[1] Untreated or suboptimally treated hypertension could lead to increased risk of morbidity and mortality due to cardiovascular, cerebrovascular, or renal diseases. Hypertension affects close to one billion individuals worldwide. In Malaysia, the prevalence of hypertension among adults aged 30 years and above has increased from 32.9% in 1996 to 40.5% in 2004.[2] The number is continuously growing due to the progressive aging of the population. The World Health Organization reported that suboptimal blood pressure (>115 mmHg systolic blood pressure) was the cause of 62% of cerebrovascular diseases and 49% of ischemic heart diseases.[3]

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http://dx.doi.org/10.2147/PPA.S34704

Successful treatment of hypertension is important in reducing morbidity and mortality, as well as in controlling health care costs associated with these conditions. Unfortunately, blood pressure control is poor, especially in patients with chronic conditions such as hypertension. In Malaysia, based on a national survey conducted in 2004, the prevalence of hypertension (in respondents aged 30 years old and above) was 40.5% (39.3%–41.8%). Malays and the indigenous people from the state of Sabah had the highest hypertension prevalence estimates (41.3%) followed by the indigenous people of Sarawak (40.4%), the Chinese (40.0%), and the Indians (37.7%). In the same survey, it was also reported that only 26.6% (95% confidence interval [CI]: 24.2–29.0) of those taking antihypertensives had their hypertension under control (defined as having blood pressure [BP] of below 140/90 mmHg).[2]

Determinants of poor blood pressure control are many. Physicians' roles in making appropriate treatment choices and optimizing doses of medicines prescribed are vital in ensuring the success of therapy. Additionally, patients' adherence to the prescribed antihypertensive medication is also an important factor in achieving blood pressure targets. Thus, health professionals need to work in partnership with their patients to achieve treatment goals.[4]

Medication adherence is defined as "the extent to which the medication-taking behavior of a patient corresponds with agreed recommendations from a health care provider."[5] It is an important factor in achieving blood pressure control.[6] Patients that were adherent to the full regimen of their hypertension treatment were often significantly less likely to have elevated blood pressures.[6,7] Unfortunately, poor adherence to medications is widespread especially in the treatment of chronic conditions such as hypertension leading to poor health outcomes and huge medical spending on drug-related morbidity.[8] As reported by the World Health Organization, adherence to medication in patients with chronic diseases averages only around 50% in developed countries. The situation is reported to be worse in developing countries due to poor accessibility to medications and health care services.[5] The asymptomatic nature of the condition intensifies the problem of nonadherence in hypertension.[8]

In Malaysia, medication adherence studies are limited. In a 1997 study carried out in primary care in the district of Melaka Tengah, it was found that 56% of the 464 sampled patients taking antihypertensives, antidiabetics, or antiasthmatic drugs were noncompliant to their medications.[9] In another study at the outpatient clinic of Penang General Hospital using a structured questionnaire, 51.3% of patients interviewed had poor adherence to prescribed hypertensive medications.[10]

Adherence to medication can be measured using indirect methods which include patient self-reports, pill counts, pharmacy refill rates and electronic medication monitors.[11] Interviewing patients with questionnaires or using patients' self-reports has the advantage of being simple and inexpensive to be carried out. Several self-reporting questionnaires have been developed to measure patients' adherence to prescribed medicines. One of the most frequently used is the Morisky Medication Adherence Scale of which the latest version contains eight questions to assess patients' adherence to medication-taking in an outpatient setting.[12] Another self-reporting tool in the English language, the Hill-Bone Compliance to Blood Pressure Therapy Scale, contains 14 questions including eight that assess medication-taking behaviors in hypertensive patients.[13] High reliability and validity has been reported for these two tools of adherence measurement.[13,14] The Hill-Bone scale has been shown to have good internal consistency and reliability with a Cronbach's α of 0.68.[14]

Among factors that affect patients' adherence are demographic characteristics, severity of disease, complexity of drug regime (number of drugs and daily doses prescribed), drug classes (due to tolerability and side effects to medication), patients' forgetfulness and lack of understanding on the nature of disease.[15] However, the results reported in previous studies have not been consistent. In two studies, elderly and female patients were found to be less compliant.[9,16] In another study, older patients were found to be more compliant than younger patients and women were found to be significantly more compliant than men in those with newly diagnosed hypertension.[17] In another retrospective cohort study on variance in adherence among hypertensive patients, it was found that the factors that had the strongest positive effect on adherence included duration of hypertension (better adherence in patients with shorter duration) and the use of newer agents, calcium antagonists, and angiotensin-converting enzyme (ACE) inhibitors.[17] Presence of comorbidity, congestive heart failure also demonstrated higher adherence rate. A multivariate analysis of data from high blood pressure intervention trial of Korean Americans in the United States, showed that a greater number of side (effects from medication adjusted odd ratio of 1.19 [95% CI: 1.07–1.33]) and a lower level of high blood pressure knowledge adjusted odd ratio, 0.89 [95% CI: 0.79–0.99] were significantly associated with intentional nonadherence.[18] Adherence rates after one year of drug therapy in patients taking valsartan (angiotensin-receptor blocker), amlodipine (calcium-channel blocker [CCB], or lisinopril [ACE]) were 63%, 53%, and 50%, respectively.[19] Nonadherence was also found to be more pronounced in those taking two or more drugs.[9]

Patients' adherence to drug therapy has been demonstrated to influence blood pressure control. In a study of 2655 hypertensive patients in primary health care centers and hospitals in Saudi Arabia where the adherence rate was found to be 53%, the mean systolic and diastolic blood pressures were found to be significantly lower in compliant patients than in noncompliant ones.[16]

This study was conducted to estimate the rate of adherence to medications in hypertensive patients and to study the factors that might affect adherence to medications and the effects of nonadherence on blood pressure.

Material and methods

This cross-sectional, multicentered study was conducted in all seven Ministry of Health Primary Health Clinics in the District of Hulu Langat in Selangor, Malaysia. These are outpatient clinics that serve residents in the vicinity for all ailments, including providing care for patients with hypertension and diabetes. Clinic attendance for patients with hypertension and diabetes follows scheduled appointments set during previous consultations.

The sample size for this study was estimated using Krejcie and Morgan's[20] formula for calculating sample size. Based on the clinics' historical data, it was estimated that 18,300 patients with hypertension (with or without diabetes) seek treatment in Ministry of Health clinics in this district. Using this as the study's population size, the calculated sample size was 376 (at 95% confidence and 5% margin of error). This was then deliberately exceeded to increase the power of the study and to provide for exclusions, dropouts, and the need to perform subgroup analysis. Hence, a sample size of fewer than 600 patients was targeted. Each clinic was allocated 4 weeks both for the random selection of patients and for surveys on medication compliance. The data collection period was 28 weeks (4 weeks for each clinic), to cover all seven clinics.

Based on daily attendance at the clinic and the targeted sample size to be collected within the stipulated data collection period, every third hypertensive patient (with or without diabetes) who fulfilled the inclusion criteria was enrolled using systematic random sampling. Patients included in the study were 30 years old or older and had been diagnosed with essential hypertension for at least 6 months. Patients who had secondary hypertension, who were pregnant, who had incomplete patient medical records, or who were on other drugs that could increase blood pressure were excluded from the study. Demographic details, patient's health information, and the treatments given them were gathered from the patient medical records. The latest BP reading recorded in the patient medical records was taken as the outcome BP. Both the systolic blood pressure and the diastolic blood pressure were noted. If two or more readings were taken on the latest visit, the lowest reading was taken. BP readings were categorized as controlled and not controlled, applying the prevailing Malaysian Clinical Practice Guideline of 2008 for blood pressure classification.[1]

Information on the patient's health, their knowledge about their medication, and their medication adherence was obtained through face-to-face interviews with the participants using a standard survey form. Informed consent was obtained from every participant prior to the interview sessions. For medication knowledge, subjects were asked five questions on each medicine that they were taking, that is, the name of the medicine, dose, frequency, indication, and how and when it was taken. The total number of correct answers with respect to the total number of questions was expressed as a percentage.

The questions in the Medication Adherence Scale used in this study were developed using two different adherence questionnaires, the Hill-Bone Adherence to Blood Pressure Therapy Scale and the 8-item Morisky Medication Adherence Scale MMAS.[13,21] A total of seven questions relevant to the local setting were selected from these three questionnaires and condensed to form the modified Medication Adherence Scale. In completing the questionnaires, patients were required to choose their responses from a set of possible answers for easy administration and to minimize inconsistencies among different interviewers.

Each question in this new Medication Adherence Scale had a four-point Likert-type response format. Each response carried a score: none of the time = 4, some of the time = 3, most of the time = 2, and all the time = 1. The total scores were added for each patient. The total score for each patient could range from 7 (minimum) and 28 (maximum). Lower scores would reflect poorer adherence to medication therapy. A full score of 28 or a score of 27 (due to 1 point deducted from any one of the "unintentional adherence" questions, which were question 1 or question 6), were defined as adherence. A score of 26 and below was categorized as nonadherence.

Prior to its use in this study, the questionnaires were subjected to evaluation and validation. Cronbach's α was calculated to be 0.782, reflecting the good internal consistency and reliability of the New Medication Adherence Scale. Interrater agreements (between the two interviewers) indicated good consistency with the Kappa value of 0.796. Ethical approval to conduct this study was obtained from the Ministry of Health's Medical Research Ethics Committee.

Statistical analyses

Statistical analyses were conducted using SPSS software (version 16.0; SPSS Inc, Chicago, IL). The normality of data was determined using the Kolmogorov–Smirnov test, as well as skewness and kurtosis values. All tests conducted were two-tailed. The alpha level of significance for all inferential statistics was set at 0.05 unless otherwise specified. Differences in adherence scores between groups of patients with and without BP control were tested using the Mann–Whitney test. The difference in adherence scores of patients using the different drug classes or a combination of drug classes was tested using the Kruskal–Wallis test. Binary logistic regression analysis using the backward stepwise likelihood-ratio method was conducted to determine whether variable factors could significantly predict adherence.

Results

Demographics and health status

A total of 653 patients that fulfilled the inclusion criteria were enrolled as subjects for this study. The majority (63.2%) were Malays, 24.2% were Chinese, and 12.4% were Indian. More than half of the sampled patients (62.8%) were female. Most of the patients sampled (91.6%) also had had some form of formal education to at least the primary level. Their ages ranged from 32 to 84 years old, with a mean age of 57.84 years (standard deviation [SD] 9.8). The majority (69.3%) of the subjects were in the 50- to 69-year-old range.

Among all the patients sampled, 300, or 46%, were relatively newly hypertensive, having been diagnosed with hypertension within only 5 years. Out of these, 25% had been hypertensive for 3 years or fewer. Only 38 patients (5.9%) had been hypertensive for more than 20 years. The mean duration of subjects' hypertension was 8.25 years (SD 6.89), with a median of 6 years (interquartile range [IQR], 4–10). Of the 653 hypertensive patients sampled, 285 (43.64%) also had concomitant diabetes. Only 107 patients (16.4%) had normal body mass index (BMI; 18.5 to 22.9 kg/m^2), based on the World Health Organization's Body Mass Index Categories for Asians. The vast majority of the patients were either overweight (262 patients, or 40.1%) or obese (254 patients, or 38.9%). Of the 653 patients, 34.8% were also taking medications to reduce cholesterol. Only a small percentage of the sampled patients were smokers (8.4%) or alcohol users (5.5%). About 28.9% of the subjects reported family histories of cardiovascular diseases.

Adherence scores

Adherence scores obtained in the present study ranged from 16 to 28 (the maximum score possible). The distribution of scores was skewed to the left (skewness –1.77, kurtosis 3.37) with a median score of 27 (IQR 25–28), indicating more patients scoring high points. The adherence scores for each question are summarized in Table 1.

From the scores obtained, the sampled patients were categorized either as adherers or nonadherers. The frequency

Table 1 Adherence scores

Questions	Adherence score (frequency [%])				Mean score
	1	2	3	4	
1. How often do you forget to take your medicine?	6 (0.9)	74 (11.3)	312 (47.8)	261 (40.0)	3.27
2. How often do you decide not to take your medicine?	23 (3.5)	41 (6.3)	91 (13.9)	498 (76.3)	3.63
3. How often do you miss taking your medicine because you feel better?	0 (0)	15 (2.3)	36 (5.5)	602 (92.2)	3.90
4. How often do you decide to take less of your medicine?	23 (3.5)	50 (7.7)	76 (11.6)	504 (77.2)	3.62
5. How often do you stop taking your medicine because you feel sick due to effects of the medicine?	2 (0.3)	9 (1.4)	30 (4.6)	612 (93.7)	3.92
6. How often do you forget to bring along your medicine when you travel away from home?	0 (0)	1 (0.2)	48 (7.3)	604 (92.5)	3.92
7. How often do you NOT take you medicine because you run out of them at home?	3 (0.5)	12 (1.8)	69 (10.6)	568 (87.1)	3.85

Notes: Median score (interquartile range): 27 (25–28). Adherence Scores Scales: 4, none of the time; 3, some of the time; 2, most of the time; 1, all of the time.

distribution is shown in Table 2. Among all the respondents, 349 (53.4%) were adherers.

Binary logistic regression analysis was conducted to determine whether variable factors significantly predicted adherence status. The factors included age, sex, race, medicine-knowledge score, knowledge of BP goal, total number of drugs taken, duration of hypertension, maximum number of daily doses, presence of side effects, use of traditional medicines, and presence of comorbidity (diabetes). The dependent variables were "adherent" and "nonadherent."

When entered individually, of the eleven variables, seven were significant at the 5% level. These were age, sex, race, medicine-knowledge score, number of drugs currently taken, maximum number of daily doses, and the presence of diabetes. When all seven predictors were included in the binary logistic model, they significantly predicted adherence ($\chi^2 = 48.77$, df = 7, N = 652, $P < 0.001$). The R-square, coefficient of determination, was 0.096, which indicated that approximately only 10% of the variance in whether patients adhered or otherwise, could be predicted from the linear combination of the seven variables. The model fit was good (P-value = 0.935). Overall, behavior was predicted correctly in 61% of the patients, and the covariate variables were better at predicting adherence (70%) than nonadherence.

Table 3 shows the results of the binary logistic regression analysis: the odds ratio indicates by what multiplicative factor the odds of adherence to medication will increase per unit change of the predictor variables. Female patients were found to be one and a half times more likely to be adherent than male patients (odds ratio 1.38 [95% CI: 1.00–1.90; $P < 0.05$]). Patients from the Malay and Chinese ethnic groups, with odds ratios of 1.68 (95% CI: 1.03–2.73) and 2.64 (95% CI: 1.52–4.58), respectively, were also more likely to adhere, compared to patients from the Indian subgroups. The odds of adherence increased by 3% with each increase in year of age. An increase in the score for medicine knowledge was also found to increase the odds of adherence. On the other hand, the odds of adherence decreased as both the number of drugs the patient was taking and the daily dose frequency increased.

From another perspective, 56.3% of the female patients were adherers, as opposed to only 48.6% adherers among the males. Medication adherence in Malay, Chinese, and Indian patients was 52.3%, 63.3%, and 39.5%, respectively. The mean number of drugs that patients were taking was higher in nonadherers (3.67) than in adherers (3.17 [t = 3.81, df = 651, $P < 0.001$]). When the Kruskal–Wallis test was performed on the 220 subjects taking only a single drug to see if there was a significant difference in adherence scores among patients taking ACE inhibitors, beta-blockers, CCB, or diuretics (D), no significant difference in adherence scores between the different classes of drugs was found (df = 3, $\chi^2 = 2.795$; $P = 0.424$). The mean adherence scores and the rate of nonadherers in the different demographic groups are summarized in Table 4.

Blood pressure control

Blood pressure control rates, summarized in Table 5, were found to be better among adherers than nonadherers. The mean systolic blood pressure for nonadherers (139.50 mmHg ± 17.32) was significantly higher than adherers' (135.83 mmHg ± 15.79; t [618] = 2.815, 95% CI: 1.126–6.217; $P < 0.05$). The mean diastolic blood pressure for nonadherers (85.13 mmHg ± 8.48) was also significantly higher than adherers' (83.56 mmHg ± 7.26; t [600] = 2.521, 95% CI: 0.347–2.792; $P < 0.05$).

Using the Mann–Whitney test to test differences in adherence scores among patients in the BP-controlled group and the BP-noncontrolled group, the two groups were found to differ significantly in their adherence scores (z = –3.352; $P < 0.005$). In patients with controlled BP, the mean ranks of adherence score were significantly higher.

When factors that predict BP control were explored while controlling other factors that could possibly affect blood pressure, every one-unit increase in adherence score was predicted to bring about a 17% increase in the odds of having controlled blood pressure (95% CI: 1.05–1.30; $P < 0.001$).

Table 2 Frequency distribution of adherers and nonadherers

Adherence score	Adherence status	Frequency (N)	Percentage (%)
Full score (28)	Adherers	177	27.1
27 (one point deducted from either question 1 or 6)	Adherers	172	26.3
27 (one point deducted due to other questions)	Nonadherers	30	4.6
23–26	Nonadherers	222	34.0
19–22	Nonadherers	45	6.9
7–19	Nonadherers	7	1.1
Total		653	100.0

Note: Adherers were those that scored a full score of 28 or score of 27 (due to only one point deducted from Question 1 or Question 6), as described in the method section.

Table 3 Logistic regression for factors predicting medication adherence

Predictor variables	Odds ratio	(95% CI)	*P*-value
Age	1.02	(1.01, 1.04)	0.008
Sex			
Male	1.00		
Female	1.38	(1.00, 1.90)	0.048
Race			
Malay	1.68	(1.03, 2.73)	0.036
Chinese	2.64	(1.52, 4.58)	0.001
Indian	1.00		
Medicine-knowledge	1.03	(1.01, 1.04)	0.001
Number of drugs currently taken	0.84	(0.76, 0.92)	0.000
Maximum daily dose frequency	0.74	(0.61, 0.89)	0.002
Presence of diabetes			
No	1.74	(1.28, 2.39)	$<$0.0001
Yes	1.00	1.00	
Knowledge on BP goal			
Yes			0.119
No	1.00	1.00	
Duration of hypertension	–	–	0.607
Experience of side effects	–	–	0.416
Traditional medicine users		–	0.114

Notes: $\chi^2 = 48.77$; df = 7; N = 652; $P < 0.001$; $R^2 = 0.096$. Odds ratios are nonstandardized.
Abbreviation: CI, confidence interval; df, degrees of freedom.

The results of the bivariate logistic regression analysis are shown in Table 6.

Discussion

Medication adherence associated with several other parameters is an important factor in achieving blood pressure control. Due to the asymptomatic nature of the disease, patients' adherence to their prescribed medications is often a problem. The rate of medication adherence in hypertension treatment could differ from study to study based on the study methods employed, the population under study, and the definition of adherence itself. Using self-reporting questionnaires to measure adherence is simple and economical but known to overestimate adherence, because patients tend to give socially acceptable responses. Hence, scores tend to be skewed to the left: in the current study, more patients scored higher points than what our observations warranted. Nevertheless, the grading system employed here was able to distinguish adherers from nonadherers. In the current study's grading, unintentionally missing an occasional dose, but not more than four times a month (scoring 27 on the adherence score), was considered as still being adherent.

In the current study, rate of adherence was found to be 53.4%. This is consistent with another medication adherence study using similar methods conducted in Malaysia for hypertensive patients.[10] However, this rate was higher than what was reported by the World Health Organization for some other developing countries.[5] In a study of primary care patients in Malaysia, using a more stringent pill-count method, the adherence rate was reported to be 44%.[9] In the current study, when only patients with a full score of 28 were considered as being adherent, the medication adherence rate fell to 27.1%.

At the adherence rate of about 50% found in this study, it is clear that there is plenty of room for improvement in patients' adherence to their prescribed medications in the clinics studied. Looking closely at the mean adherence scores for each of the seven questions, it is clear that on most occasions, missing a dose was mainly due to patients' forgetfulness. All possible means should be taken to enhance patients' memory, to keep to the dosing regimen for their medications. Steps should be taken by health care professionals through counseling sessions to help patients organize their medication taking. For example, this could be achieved by planning for medication taking to correspond with certain activities, such as eating meals, or by setting alarms to go off at medicine-taking time during the initial stages of their therapy.

After controlling for other demographic variables in this study, female patients were found to be one and a half times more compliant than male patients. This is consistent with another study on patients' adherence to hypertensive medication by Schoberberger in 2002: it found that the incidence of adherence was significantly lower in male patients.[22] However, a literature review of several studies on the predictors of medication adherence in the elderly, and on the effects of age, sex, knowledge, attitudes, and comorbidities on medication adherence, found those studies to be inconsistent.[23] Nevertheless, identifying groups of patients in a population that tends to have more problems with medication adherence enables more targeted efforts toward improvement, for example, from this study, male or very old patients (above 70 years old) can be targeted.

Ethnicity was also found to be linked to nonadherence in the current study. Malay and Chinese were found to be more likely (1.5 and 2 times, respectively) than Indians to adhere to medication taking; more detailed studies can be carried out to identify the reasons for poorer adherence among Indians in these clinics. Because the more commonly used languages of caregivers in these clinics are Malay and English, language barriers could be one possible reason for poor knowledge of disease and treatment among this group.

Table 4 Adherence by demographics and health status of patients

	N	Mean adherence score	Adherers (frequency)	%	Nonadherers (frequency)	%
Age category						
30–49	127	25.42	59	46.46	68	53.54
50–59	244	26.06	123	50.41	121	49.59
60–69	208	26.37	124	59.62	84	40.38
≥70	74	26.28	43	58.11	31	41.89
Sex						
Male	243	26.03	118	48.6	125	51.4
Female	410	26.15	231	56.3	179	43.7
Race						
Malay	413	26.02	216	52.3	197	47.7
Chinese	158	26.47	100	63.3	58	36.7
Indian	81	25.83	32	39.5	49	60.5
Others	1	27.00	1	100	0	0
Medicine-knowledge score						
81–100	99	26.29	53	53.54	46	46.46
71–80	434	26.33	247	56.9	187	43.1
51–70	111	25.33	48	43.24	63	56.76
0–50	9	22.89	1	11.11	8	88.9
Knowledge of BP goal						
Yes	191	26.29	111	58.1	80	41.9
No	462	26.03	238	51.5	224	48.5
Number of drugs taken						
1	221	26.38	131	59.3	90	40.7
2	319	26.01	162	50.8	157	49.2
3	105	25.89	54	51.4	51	48.6
>3	8	25.38	2	25.0	6	75.0
Duration of hypertension						
≤5	300	26.11	157	52.33	143	47.67
6–10	192	26.18	112	58.3	80	41.7
11–20	123	25.98	60	48.8	63	51.2
>20	38	26.11	20	52.63	18	47.37
Maximum daily dose frequency						
1	252	26.48	151	59.9	101	40.1
2	215	26.09	114	53.0	101	47
3	186	25.62	84	45.2	102	54.8
Experience of side effects						
No	575	26.08	304	52.9	271	47.1
Yes	78	26.33	45	57.7	33	42.3
Traditional medicine users						
No	477	26.18	264	55.3	213	44.7
Yes	176	25.92	85	48.3	91	51.7
Presence of diabetes						
No	368	26.30	219	59.5	149	40.5
Yes	285	25.86	130	45.6	155	54.4
Drug group (monotherapy)						
ACE	42	26.29	–	–	–	–
BB	91	26.25	–	–	–	–
CCB	51	26.24	–	–	–	–
D	18	27.11	–	–	–	–

Abbreviations: ACE, angiotensin-converting enzyme; BB, beta-blockers; BP, blood pressure; CCB, calcium-channel blockers; D, diuretics.

Table 5 Blood pressures and % of BP control in adherers and nonadherers

	Mean DBP (SD)	Mean SBP (SD)	BP controlled		BP not controlled	
			Frequency	%	Frequency	%
Adherers	83.56 (7.26)	135.83 (15.79)	112	63.6	64	36.4
Nonadherers	85.13 (8.48)	139.50 (17.32)	237	49.7	240	50.3

Abbreviations: BP, blood pressure; DBP, diastolic blood pressure; SBP, systolic blood pressure; SD, standard deviation.

Table 6 Bivariate logistic regression analysis on factors that predict BP control

Predictor variables	Odds ratio	CI	*P*-value
Age	–		0.82
Sex			
Male	1.51	(1.06, 2.14)	0.02
Female	1.00		
Race (excluding other)			
Malay	–		0.393
Chinese	–		0.752
Indian	1.00		
Duration of hypertension	–		0.544
Body mass index			
Normal	2.54	(0.90, 7.18)	0.080
Overweight	–		0.267
Obese	–		0.270
Morbidly obese	1.00		
Concomitant diabetes			
Hypertension only	8.11	(5.05, 13.02)	<0.001
Hypertension with diabetes	1.00		
Smoking status			
No	–		0.490
Yes	1.00		
CVD family history			
No	–		0.674
Yes	1.00		
Medication adherence	1.20	(1.09, 1.33)	<0.001
Number of hypertensive drugs used (excluding 4 and 5)			
3	0.39	(0.21, 0.71)	0.002
2	–		0.344
1	1.00		

Notes: Dependent variable was "Controlled BP"; Yes (1) and No (0).
Abbreviations: BP, blood pressure; CI, 95% confidence interval; CVD, cardiovascular disease.

With this information, more targeted efforts to improve medication adherence could be taken.

Good health awareness and knowledge of high blood pressure, as well as of the medications being taken, have been shown to be associated with good adherence to medication regimes in several studies.[18,24] In the current study, the odds of adhering to medication were modestly improved by 3% with every one-point increase in knowledge scores for the medicines prescribed. It has been proven again, here, that improving patients' knowledge, be it of their illness or of the medications that they are taking, results in better adherence to their medications. Getting patients involved in their treatments by imparting relevant knowledge often empowers patients to be more concerned about their health. This can be achieved through more patient counseling and health care professional–patient interactions. A lot of improvement is possible in this area in primary health clinics by training and mobilizing the health care givers.

On the other hand, when all other factors were controlled, the odds of adherence were found to decrease by 13% when the number of drugs the patient was taking increased, and by 22% when daily dose frequencies increased. This demonstrated the importance of keeping the number of drugs prescribed for patients and the daily dose frequencies to a minimum. Keeping the medication regime simple will promote better adherence by hypertensive patients. In another review, a clear association between medication adherence and a particular drug, dosage forms, number of medications, and physician–patient communication was also established.[23]

Newly diagnosed hypertensive patients are usually less persistent in medicine taking than are established hypertensives. Problems with perseverance with treatment often occur in the first 6 months of starting hypertensive therapy and can persist over the next 4 years.[25] In the current study, patients were mainly "established" hypertensives, with a mean average of 8.5 years since being diagnosed as having hypertension. The predictor variable "duration of hypertension" was not shown to affect medication adherence or blood pressure control.

The cost of medication is another factor that can affect adherence to prescribed medications.[5] Patients who were prescribed more expensive drugs were less likely to adhere to the prescribed medications, as a result of their reduced affordability. However, in our research, the cost of medications was not studied as one of the factors affecting adherence, since medications were provided free of charge by the provider (Malaysian Ministry of Health) to patients attending these primary health clinics.

All the variables explored in this study could only explain 10% of the variation in adherence. This could be due to the fact that adherence hinged strongly on each patient's attitude and behavior. This also indicated that adherence cannot be easily predicted based on patients' demographic characteristics alone.

Nevertheless, the importance of improving medication adherence to achieve the full benefits of treatment is evident. It was demonstrated in this study that patients who achieved targeted BP had significantly higher adherence scores, compared to the group with uncontrolled BP.

Uncontrolled BP can bring about serious consequences, including higher rates of morbidity and mortality and causing a great economic burden to the health care sector. Adherence to medication is a vital factor that can affect blood pressure control. As observed here, even a small improvement in adherence could greatly improve blood pressure control. In view of its positive effect on patients' mortality and morbidity, and on the health care costs to the nation, intervention programs should be planned accordingly, to correct the current situation observed by this study. Thus, efforts should always be made to identify the reasons for nonadherence and the steps to be taken to improve it, through better communication between health care providers and patients.

Conclusion

The medication adherence rate among hypertensive patients treated in primary care facilities in Malaysia were measured using a standard survey form; it was found to be 53.4%. Male and Indian patients were also found to have poorer adherence, compared to their counterparts. Among the factors identified as negatively affecting adherence in these groups of patients were poor knowledge of the medications and diseases at issue, increasing numbers of medications being taken, and increasing dose frequencies.

A poor adherence rate was found to negatively affect blood pressure control. Developing intervention programs to address some of the factors identified is necessary to improve adherence and, in turn, to improve blood pressure control. A multidisciplinary approach with greater involvement of patients in managing their conditions should be adopted to promote better adherence to whatever medication regime is prescribed.

Acknowledgments

We would like to thank the Director General of Health of Malaysia for granting us the permission to publish this study. We are grateful to the National Institute of Health (NIH), Malaysia for providing financial assistance through the NIH grant (NMRR-08-29-1184). Our gratitude also goes to all members of the National Medicines Expenditure Survey (NMES) Committee, Pharmaceutical Services Division, Ministry of Health, for their views, assistance, and cooperation. Our thanks to Mr Adam bin Bujang from the Clinical Research Center for his invaluable input and guidance on the statistical aspects of the research, and to Cik Raihan Sabirin for her technical assistance.

Disclosure

The authors report no conflicts of interest in this work.

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