



**ELEVATED BLOOD PRESSURE AMONG PATIENTS WITH HYPERTENSION IN  
GENERAL HOSPITAL OF PENANG, MALAYSIA: DOES POOR ADHERENCE MATTER?**

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**ABSTRACT**

Poor adherence to medication is a major problem among patients with hypertension, and has been identified as one of the main causes of failure to achieve adequate control of blood pressure (BP). In turn, patients with hypertension who have elevated BP as a result of their poor adherence to medication remain at risk for serious morbidity and mortality. The objectives of this study were (i) to measure adherence to antihypertensive therapy of the hypertensive Malaysian population and (ii) to investigate the relationship between poor adherence to antihypertensive therapy and blood pressure outcome (systolic and diastolic blood pressure). A semi-standard survey interview method was conducted and distributed on a convenience sample of 518 patients with antihypertensive therapy at the clinic of Penang General Hospital, Malaysia. Adherence was assessed using the MORISKY Medication Adherence Scale (MMAS). The second objective was tested using simple linear regression analysis (Coefficient Beta) with poor adherence as the independent variable and SBP/DBP as the dependent variable. 380 patients were included in the study with a response rate 73.36%. Our results show that, the MORISKY scale items were summed that 195 (51.3%) patients had poor adherence to antihypertensive medication. To identify the value of poor adherence on elevated systolic blood pressure, the result of simple linear regression show that the P-value of  $0.001 < 0.05$  indicates that poor adherence is a statistically significant predictor of SBP at the 0.05 alpha level. Finally the value of poor adherence on elevated diastolic blood pressure shows that the P-value of  $0.001 < 0.05$  indicates that poor adherence is a statistically significant predictor of DBP at the 0.05 alpha level. Similar to what has been reported worldwide, increasing adherence of the patient to medication significantly improves BP control, which will eventually reduce morbidity and mortality.

**Keywords:** Adherence; Antihypertensive therapy; Blood pressure; MMAS; Malaysia

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**INTRODUCTION**

One of the most common chronic diseases in Malaysia is essential hypertension<sup>1</sup>. Last national survey which sampled more than 16,000 Malaysians, reported that the prevalence of hypertension amongst those aged 30 years and above has increased from 32.9% in 1996 to 40.5% in 2004 and to 42.6% in 2006<sup>2</sup>. Many patients with hypertension have persistently elevated blood pressures (BP)<sup>3,4</sup>. As far as hypertension is concerned, adhering to prescribed medication is critically important for controlling blood pressure and reducing the associated risk of cardiovascular complications such as stroke<sup>5</sup>. This has

been proved by studies which show that patients who take at least 80% of their medications have significantly better control over their blood pressure levels compared with those who take less than 50% of their prescribed medications<sup>6</sup>.

Poor adherence to medications is a major public health problem and remains one of the main unresolved issues in the management of hypertension<sup>1</sup>. Adherence to medication has been defined as the extent to which a person's behaviour coincides with medical or health advice<sup>7</sup>. The seriousness of poor adherence to medical regimens in Malaysia was raised in 2006, after the publishing of the results of a study by Hassan which

showed that 55.8% of drugs prescribed by physicians were not taken as directed<sup>8</sup>.

Unfortunately, patients with poor adherence to hypertension treatments are at an increased risk of serious adverse outcomes, including kidney failure, blindness, stroke, and heart disease<sup>9</sup>. Many studies have documented low rates of adherence to antihypertensive medication among patients with hypertension<sup>10</sup>. Thus, to combat poor medication adherence, clinicians must identify non-adherent patients.

Furthermore, high blood pressure is particularly liable to be a result of non adherence of prescribed medication. This is largely because hypertension has no symptoms, unless it is very severe<sup>2</sup>. Any delay in taking appropriate doses by patients can worsen their condition. The symptoms of risk associated with poor adherence can take quite some time to appear (Silent Killer) when compared with other chronic diseases such as epilepsy<sup>11</sup>.

**MATERIALS AND METHODS**

The study design is a non experimental retro-prospective cohort study, which deals with adherence to anti-

hypertensive medication. The plan for this study was to determine poor adherence to anti-hypertensive therapy in outpatient hypertension department at the Hospital Pulau Pinang (General Penang Hospital), the biggest government hospital in Penang, located at Jalan Resideni. The survey method is a quantitative design that uses structured questionnaires (Morisky Scale) as the primary method for data collection. In the mid-1980s, Morisky and colleagues developed a brief questionnaire four items' (see Table-1) to aid practitioners in prospectively predicting adherence with antihypertensive medications<sup>7</sup>. Subsequently, the instrument was validated in a number of studies and demonstrated to have good psychometric properties<sup>12</sup>. The advantages of this over other methods of measurement include its simplicity, speed, cheap and viability of use. Several studies highlighted the usefulness of the self-report as an adherence measurement tool. Table 1 shows five-point Likert scale was used throughout the questionnaire for stating the required scaling to keep the mind of the respondents more focused on the statement.

**Table 1: Morisky simplified self-report measure of adherence scale**

Morisky items	Never	Rarely	Sometime	Often	Always
1- Do you ever forget to take your medicine?	1	2	3	4	5
2- Are you careless at times about taking your medicine?	1	2	3	4	5
3- When you feel better do you sometimes stop taking your medicine?	1	2	3	4	5
4- Sometimes if you feel worse when you take the medicine, do you stop taking it?	1	2	3	4	5

According to Shelly, patients are considered adherent to the treatment if they answered (1 = never or 2 = rarely) for all Morisky scale, except those

patients who are considered poorly adherent<sup>12</sup>. Because the study was conducted in Malaysia, the questionnaire required translation to

Malay language (Bahasa). Back-translation was used to assure the accuracy of the translation. The final translated questionnaire was then pre-tested with a panel of ten Malaysian citizens who had obtained Master degrees in the United States. Members of this pre-test group were asked for any comments on the questionnaire, pertaining to ambiguity or awkwardness in the wording of the questions. In addition, pilot study was planned as a part of the scale development methodology to ensure a comprehensive analysis for a range of perspectives, to detect any possible problems associated with the format, wording, and measurement, and to make sure that the respondents comprehended the instructions, questions.

Due to the time constraint and impossible to treat our sample rigorously, that we have no clear details about the schedule list of the respondents (patients), it was decided to conduct convenience sampling technique for this research. In clinical practice, we used patients who are available to us as our sample, we sample simply by asking for volunteers, as the name implies, and sampling refers to the collection of information from member of the population who are conveniently available. As a secondary data method, we used the formulation table (Clinical form) design for extracting data from patients' records on their clinical outcome during 2006 and 2007. Our research requires that we identify the changes in the readings of both SBP and DBP in the hypertensive patients enrolled in the study.

With regard to the size of the sample, 518 questionnaires were distributed to the patients while they were waiting for their turn to meet the doctor at the waiting area of the clinic. Once the data were collected from patients, only

useable medical records that met our sample frame were selected and matched with the questionnaire data. In addition, a number of other inclusion and exclusion criteria were used to define our sample frame. The period of data collection was from 15th June 2007 to 10th February 2008. The Clinical Research Center (CRC) at the General Hospital in Penang and Malaysian Ministry of Health granted approval for accessing the patients' medical records and distributing the questionnaire.

#### **Inclusion criteria**

(Aged  $\geq 18$  and  $\leq 60$  years, diagnosed with essential hypertension, received at least one anti-hypertensive medication, duration of hypertension from 2 to 5 years)

#### **Exclusion criteria**

Secondary hypertension states such as chronic renal disease, reno-vascular disease, Cushing's syndrome, patients diagnosed with other co-morbid diseases such as diabetes mellitus, dyslipidemia, heart failure, hepatic dysfunction, psychiatric disorder, pregnant women, finally, cancer patients.

The data collected was analyzed using SPSS® Version 15.0<sup>13</sup>. Data distributions were normal and therefore parametric analysis was conducted. To identify the value of independent predictors of poor adherence on elevated blood pressure, a simple linear regression analysis was performed. Before using the linear regression analysis it is imperative that we run the correlation test because correlations are extremely useful for showing us which variables associate. This saves us time and energy, because if our study variables do not correlate, then why run further tests to tease out a relationship that does not exist (unless, of course, there should be a relationship—then we would want to know why none exists,

but once again, correlation tells us one way or another).

## RESULTS

The final response rate from 518 patients was 73.36% ( $n = 380$ ).

**Table 2: Analyzing results of demographic data**

Variables	Valid	Frequency	Percentage (%)
<b>Gender</b>	Male	218	57.4
	Female	162	42.6
<b>Age</b>	18 - 28	0	0
	29 - 39	8	2.1
	40 - 50	172	45.3
	51 - 60	200	52.6
<b>Race</b>	Malay	146	38.4
	Chinese	129	33.9
	Indian	105	27.6
<b>Adherence</b>	Good	185	48.7
	Poor	195	51.3
<b>Hospital admission</b>	Yes	13	3.2
	No	368	96.8
<b>Income</b>	Below 500 RM	9	2.6
	500-1000 RM	38	9.9
	1000-2000 RM	67	17.6
	More than 2000 RM	266	69.9
<b>Education</b>	High school	330	86.4
	Bachelor Degree	50	13.6
	Master Degree	0	0
	Doctoral Degree	0	0

\*(RM) Malaysian currency

From Table 2, we can infer the following. Overall, 218 (57.4%) of the respondents were male and 162 (42.6%) were female. The respondents' ages are between 51 years and 60 years, 200 with 52.6%, and ages are between 40-50 years old, with 45.3% of the respondents. The highest number of the respondents were Malay ( $n = 146$ ; 38.4%), followed by Chinese (33.9%) and Indian (27.6%). Most of the respondents had poor adherence ( $n = 195$ ; 51.3%), whereas 48.7% ( $n = 185$ ) had good adherence. The level of the education shows that the highest number of the respondents hold high school (330, 86.4%), which is approximately most of the sample. The result shows the highest income is more

than 2000 Malaysian Ringgit (Malaysian currency) 69.6%. The respondents' ages are between 36 years old and 45 years, 271 with 70.9% of the respondents.

Pearson's correlation coefficient analysis was used to describe associations between poor adherence and elevated blood pressure outcome. According to the results of Pearson's correlation coefficient analysis (see Table 3), a significant positive correlation was observed between poor adherence and elevated SBP (Pearson's correlation coefficient,  $r = 0.849$ ,  $p = 0.000 < 0.01$ ). Pearson's correlation coefficient analysis also shows a positive correlation between poor adherence and elevated DBP ( $r = 0.827$ ,  $p = 0.000 < 0.01$ )

**Table 3: Pearsons correlation between poor adherence and elevated blood pressure outcome**

Correlations		Poor Adherence	SBP	DBP
Poor Adherence	Pearson Correlation	1		
	Sig. (two-tailed)			
	<i>n</i>	380		
SBP	Pearson Correlation	0.849(**)	1	
	Sig. (two-tailed)	0.000		
	<i>n</i>	380	380	
DBP	Pearson Correlation	0.827(**)	0.748(**)	1
	Sig. (two-tailed)	0.000	0.000	
	<i>n</i>	380	380	380

\*\* Correlation is significant at the 0.01 level (two-tailed).

Overall, Pearson's correlation suggested a significant result in both the tested relationships; results of this analysis suggest a higher level of correspondence between poor adherence and elevated blood pressure. To identify the value of independent predictors of poor adherence on elevated blood pressure, a linear regression analysis was performed (see Tables 4 and 5).

The independent variable 'poor adherence' has a standard coefficient of

$\beta = 1.379$  with a *t*-value of 31.232. The *P*-value of  $0.000 < 0.05$  indicates that poor adherence is a statistically significant predictor of SBP at the 0.05 alpha level. The *R*<sup>2</sup> value of 0.721 indicates that 72.1% of the variance in elevated SBP can be predicted from the poor adherence variable.

Tables 4 & 5 show that the independent variable 'poor adherence' has a standard coefficient of  $\beta = 1.328$  with a *t*-value of 28.601.

**Table 4: Simple linear regression analysis (Adherence vs. SBP)**

Model Independent variable (Adherence)	Standardized Coefficients Beta	<i>t</i> -Value	Sig.
H5a	1.379	31.232	0.000
Equation			
<i>R</i> <sup>2</sup>	0.721		
<i>F</i>	975.436		
Sig.	0.000		

\*\*\**P*=0.001<0.01, \*\**P* = <0. 05 ~ Dependent Variable: SBP

**Table 5: Simple linear regression analysis (Adherence vs. DBP)**

Model Independent variable (Adherence)	Standardized Coefficients Beta	<i>t</i> -Value	Sig.
H5b	1.328	28.601	0.000
Equation			
<i>R</i> <sup>2</sup>	0.684		
<i>F</i>	818.017		
Sig.	0.000		

\*\*\**P*=0.000<0.01, \*\**P* = <0. 05 ~ Dependent Variable: DBP

The *P*-value of  $0.001 < 0.05$  indicates that poor adherence is a statistically significant predictor of DBP at the 0.05 alpha level. The  $R^2$  value of 0.684 indicates that 68.4% of the variance in elevated DBP can be predicted from the poor adherence variable.

## **DISCUSSION & CONCLUSION**

### **(i) Identification of patients with poor adherence**

In relation to the first objective, one of the main findings of this study was the identification of patients with poor adherence. The MORISKY scale items were summed, and the descriptive statistics presented in Table 1, showed that 195 patients had poor adherence to hypertensive medication. According to this result, 51.3% of our total sample was taking their medicines irregularly. This finding concurs with the finding by Hassan <sup>8</sup>. The rate of adherence is low compared with the rate that is prevalent in western population such as in Scotland where a 91% rate of adherence has been reported <sup>14</sup>, and in Pakistan where a 77% rate of adherence has been reported <sup>15</sup>.

Poor adherence is related to the way in which a patient judges personal need for a medication against a variety of competing needs, wants, and concerns (adverse effects, stigma, cultural beliefs, cost, etc.). In fact, patients are not the only factor that affects adherence, with respect to the demographic variables, no statistically significant associations were found between the change in adherent patients' level and demographic variables in this study. Healthcare providers, complex medication regimens, and accessing and navigating the healthcare delivery system can contribute to the problem of non-adherence.

There are many factors that effect adherence; it could be because of the disease itself, given that hypertension is a deadly condition that possesses no warning signs (asymptomatic) and is often dubbed as the 'silent killer'. In fact, while the questionnaire was distributed, it was noted that, most patients had not discovered that their blood pressure elevated until they had some degree of trouble. In 2008, Paul S. found that most chronic hypertensive patients have difficulty adhering to a prescribed regimen <sup>16</sup>. In fact, the lack of awareness of hypertension and lack of adequate control with treatment could also be reasons for poor adherence to therapy <sup>2</sup>. These findings may be used to identify the subset of population at risk of low adherence who should be targeted for interventions to achieve better blood pressure control and hence prevent complications.

### **(ii) Poor adherence with elevated blood pressure outcome**

A significant positive correlation exists between poor adherence and elevated SBP and DBP, which was inferred from the results of this study as show in Table 6-35; thus, hypothesis H4 (a,b) was accepted. Good adherence was found to improve the control over SBP and DBP and reduce the complications of hypertension.

For the lifelong treatment of asymptomatic conditions or risk factors like hypertension, the success of treatment depends largely on the level of drug adherence. Previous research has firmly established that there is a continuous relationship between increased poor adherence and increased BP <sup>17</sup>. One of the major reasons for the elevated BP in the United States, even though standard antihypertensive treatments are available, is poor patient adherence to drug therapy <sup>18</sup>.

Schroeder, Fahey & Ebrahim (2006) and Inkster *et al.* (2006) have raised important issues pertaining to the importance of adherence in achieving control BP and ways to measure it<sup>14, 19</sup>. According to their finding, adherence poses a greater problem in people who have recently commenced on antihypertensive therapy, and it is from studies conducted among such patients that the somewhat alarming non-adherence rates of >50% are largely derived.

An experimental study done by Braam & Lenders (2007) in Netherlands, investigated insufficient response to antihypertensive drug therapy considering poor adherence, patients were followed up for a prolong time period at the outpatient clinic, found BP remained high, despite treatment with a great number of antihypertensive drugs<sup>20</sup>. All of patients on several occasions the issue of insufficient drug adherence was discussed without any success. Also found, during the hospital stay it can be shown that BP is lowered with the drug already prescribed at the outpatient clinic<sup>20</sup>.

In conclusion, control blood pressure can be achieved by improving adherence. Patients were informed that during two months adherence would be measured using electronic monitoring, for more than 50% of patients insufficient adherence was shown to be the reason for inadequate BP control<sup>20</sup>. Previous studies such as those by Lin & Ciechanowski (2008) and Albert (2008) also support this point<sup>5, 21</sup>.

Thus, increasing adherence of the patient to medication significantly improves BP control, which will eventually reduce morbidity and mortality. According to data from the National Committee for Quality Assurance (NCQA), it is interesting to note that a reduction in SBP by 5 mm Hg

can reduce the incidence of stroke mortality by 14%, coronary heart disease mortality by 9%, and total mortality by 7%<sup>22</sup>.

Malaysia is a growing nation, filled with dreams of becoming an industrialized country and reaching the status of a developed nation by 2020<sup>23</sup>. Malaysia also hopes to become a respected and highly regarded country, on par with other developed nations in the eyes of the rest of the world. Nevertheless, there is a growing worry on the increasing prevalence of chronic diseases among its population; health-care professionals are pondering over the dreadful consequences of chronic ailments that the present generation faces and the future generation is destined to face, unless something is done on a war-footing basis.

Furthermore, better control of BP would translate into decreased rate of cardiovascular morbidity and mortality, and decreased health-care resource utilization. Therefore, a cost-effective intervention would be to improve adherence to antihypertensive pharmacotherapy, as hypertension treatment is itself generally cost-effective<sup>24, 25</sup>. Thus, it would be appropriate to suggest that government efforts should be focused on the types of interventions to improve adherence among patients in Malaysia. These interventions can help in closing the gap between the clinical efficacy of interventions and their effectiveness when used in the field. As government level, many strategies could help for improving adherence such as:

- Develop and implement programs for patient compliance support (e.g., group support programs, educational interventions, monitoring clinics, compliance packaging aids, and multiple medicine reviews). Keep health care providers informed about these

programs so they can refer appropriate patients as part of an individualized compliance regimen.

- Develop and implement innovative programs that teach patients responsibility for and involvement in his/her health care.

This study had several limitations need to be acknowledged. Certain limitations relating to the relatively small sample occurred. This does not reflect the full range of Malaysian diversity, the scope of this study only targeted the outpatients diagnosed with essential hypertension and treated for hypertension in the General Hospital of Penang in Malaysia. The measure used for this study is based only on self-reports (Morisky Scale). Many other measures could also be applied to identify patients with poor adherence, such as refill, pill counts, and electronic monitoring. Additional studies can be carried out to investigate this area of the study further:

As mentioned earlier, this study has been conducted only on outpatients diagnosed with essential hypertension and treated for hypertension in the General Hospital of Penang in Malaysia. Therefore, future studies can be conducted in other places in Malaysia. Finally, more research is required to study the effect of poor adherence to medication on end-organ damage, because this needs long period.

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