

Antihypertensive Prescribing Pattern and Blood Pressure Control among hypertensive patients over a Ten Year period in a Primary Care Setting in Malaysia

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Abstract: Suboptimal control blood pressure (BP) leads to multiple complications. This study aims to examine BP control and the change in prescribing pattern of antihypertensive agents over a 10-year period. Data was obtained from the 10-year retrospective cohort of randomly selected adult patients registered with the Department of Primary Care Medicine Clinic at the University of Malaya Medical Centre. Demographic data, BP and anti-hypertensive drug use in 1998, 2002 and 2007 were captured from patient records. Target BP control was defined as BP <140/90mmHg for those with hypertension alone and <130/80mmHg for those hypertensives with concomitant diabetes mellitus or chronic kidney disease. A total of 886 hypertensive patients were recruited. The mean age was 57.2 years (SD±9.6); 63.1% were female. The mean BP at baseline and at the end of 10-year were 146 / 87 (18/10) mmHg and 136/80 (16/9) mmHg respectively. In 1998, 74.3%, 22.5% and 1.6% were on monotherapy, 2 agents and ≥3 agents respectively. In 2007 after 10 years, 24.9%, 46.5% and 26.9% were on monotherapy, 2 agents and ≥3 agents respectively. At the end of 10 years there was improvement in overall blood pressure control, increasing from 15.6% in 1998 to 43.7% in 2007. However, the control rate of BP is still far from optimal in spite of an increase in the number of agents per patients used over a 10 year follow-up. Based on our study the majority of patients with hypertension will need 2 or more agents to achieve target BP.

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1. Introduction

Hypertension has been recognised as a modifiable risk factor for cardiovascular diseases such as stroke, heart disease and renal disease since the 1950s [1]. It is highly prevalent in populations worldwide and effective evaluation, treatment and control of high blood pressure to target levels (<140/90mmHg) has unquestionable health benefits [2]. Studies have shown that effective treatment significantly reduces cardiovascular disease mortality and morbidity and the deterioration of kidney function among patients with hypertension [2-6].

However, despite extensive public health campaigns, primary and secondary intervention strategies, hypertension and its negative health consequences continue to pose a worldwide problem. In total, hypertension is estimated to account for 4.5% of the global disease burden [7].

The concept of cardiovascular disease as a problem restricted to the industrialised world is outdated. It is the leading cause of death across Asia

and much needed research into cardiovascular disease in the Asia-Pacific region is beginning. A number of longitudinal cohort studies, investigating the associations between cardiovascular risk factors and stroke, coronary heart disease and mortality are currently active [8]. These aim to characterise the differences and similarities between Western and Asian populations. Such knowledge is vital to allow the design and implementation of effective local intervention strategies. Presently, evidence emerging from these cohort studies suggests the hazards of high blood pressure are similar between East and West [9].

Malaysia, a middle income country in South East Asia, has a high and rapidly rising prevalence of hypertension. Information from cross sectional population surveys has shown the prevalence of hypertension in adults (≥ 30 years old) has increased from 32.9% in 1996 to 42.6% in 2006[10, 11]. This relative increase of 28.6% combined with the high absolute prevalence is alarming, but similar trends have been observed in other low or middle income

Asian countries, such as China [12]. In comparison high income countries have seen less dramatic rises or have even seen falls. For example, in the USA the age-adjusted prevalence of hypertension was 24.4% in the 1988-1994 National Health and Nutrition Examination Survey, compared to 28.9% in the 1999-2004 survey; a relative increase of 18%[13]. More locally, in New Zealand and Australia, a downward trend in population systolic blood pressure has been observed, and in New Zealand this trend has been estimated to account for up to 42% of the observed decline in coronary heart disease mortality from 1980 to 2004[14].

Despite the high absolute prevalence of hypertension in Malaysia, improvements in awareness, treatment and control of hypertension have been limited. In 2006, only 26.3% achieved target blood pressure control amongst the respondents who were aware of their hypertensive state and currently receiving treatment [11]. These figures have only marginally improved from the 1996 national survey [10] and are comparable with the control rates reported in the Chinese national survey (2001-2002)[12]. However, these figures fall short of those reported for high income countries. In the USA 35.1% of the patients with hypertension achieved target blood pressure control (1999-2004), a relative increase of 34.5% in those achieving control since 1988-1994[13].

Therefore, more work is needed to address the imbalance between the high prevalence of hypertension and its control especially in view that control rate is generally less than 50%[2, 15]. To date information gathered on hypertension and its management in Malaysia is derived only from cross sectional population snapshots. To our knowledge, no information is available on the presence and management of hypertension from longitudinal cohort studies. Here we report findings from a retrospective cohort study of primary care patients attending an urban clinic in Malaysia over ten years. This retrospective cohort study aimed to examine blood pressure control and the use of antihypertensive agents amongst a hypertensive population treated at a university hospital primary care clinic in Malaysia. It is important to look at how some improvements have been made and where future efforts and resources should be directed.

2. Material and Methods

2.1 Setting

This data is part of a 10-year retrospective cohort study of patients registered with the Department of Primary Care Medicine Clinic at the University of Malaya Medical Centre (UMMC). This clinic besides offering the usual primary care services

also provides substantial care for patients with chronic diseases like hypertension, diabetes and dyslipidaemia. It serves around 450,000 inhabitants. This clinic is run by family medicine specialists, vocational trainees in family medicine and other medical officers.

2.2 Inclusion criteria

The cohort was randomly selected from the clinic patient records based on numbers generated by a computer program. Baseline data was collected in 1998, and follow-up data collected in 2002 and 2007 at five-year intervals. Out of this original cohort, all adult patients aged 18 with diagnosis of hypertension i.e. BP \geq 140/90 mmHg or on antihypertensive agents were identified and included in this analysis.

2.3 Data collection

Socio-demographic data and co-morbidities from patient records were captured. Documented blood pressure measured by mercury sphygmomanometer as well as the patient's height and weight were captured. Target control BP was defined as BP $<$ 140/90mmHg for non-diabetics and $<$ 130/80mmHg for patients with diabetes mellitus (DM). Body mass index (BMI) was calculated as weight in kilograms per square meter (kg/m^2).

Diabetes mellitus was those clinically diagnosed as diabetes or those taking the diabetics medications. Chronic kidney disease is defined as the eGFR $<$ 60ml/min based on Cockcroft-Gault formula[16]. Anti-hypertensive drug use was also captured and classified into the following classes; RAS (renin-angiotensin system: i.e. angiotensin converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB); beta-blockers (β -blockers); calcium-channel blocker (CCB); diuretics and alpha-blockers (α -blockers).

2.4 Classification of Hypertension

We categorised the patient into three stages: Stage 1 HPT defined as BP of 140-159/90-99 mmHg; Stage 2 hypertension as BP 160-179/100-109 mmHg and Stage 3 hypertension when BP is \geq 180/110mmHg [17].

2.5 Statistical analysis

Analysis was performed using SPSS version 19 (SPSS IBM New York, United States). Continuous data is described as mean and standard deviation (SD) when the distribution is normal. However when the data is a skewed distribution, median and interquartile range (25-75th percentiles) are used. Categorical data is reported as proportions (percentage). Chi-square test or Fisher exact tests are used for the categorical or dichotomous predictors. All analyses are done at 95% confidence intervals (CI), and a p-value of less than 0.05 indicates statistical significance.

3. Results

A total 1547 patients were in the original cohort and 886 patients were hypertensive. After excluding missing data on BP in 1998 (n=1) and missing data on BP in 2007(n=63), finally 822 patients who had complete data and who fulfilled the inclusion criteria were entered into our analysis. Table 1 shows the demographics of patients with hypertension. In 1998, the mean age was 57.2 ± 9.6 years, 63.1% were female and 22.4% were aged ≥ 65 years. The mean BMI was 27.1 ± 4.6 kg/m². Chinese were the largest ethnic groups among the hypertensive patients. 6.7% were smokers. The obesity among patients less than 65 years old was 31.7% (n= 202) compared to 22.8% (n=42) in those 65 years and older. The mean BP (Table 2) at baseline and at the end of 10-year were 146 / 87 (18/10) mmHg and 136/80 (16/9) mmHg respectively.

Table 2 shows the prescribing pattern of antihypertensive agents over the 10-years.

In 1998 three quarters of the patients were on monotherapy and this was reduced by two thirds to 24.9% being on monotherapy at the end of 10 years. The commonest prescribed monotherapy at baseline was β -blockers and this changed to CCB 10-year later. The number of patients on 2 agents doubled at the end of 10 years. There was an increase in the use of three or more agents at the end of 10 years. The commonest prescribed agent in 1998 was β -blockers. However, at the end of 10-years, it changed to CCB. The use of RAS agents which was low at baseline increased

fourfold at the end of 10-year. The commonest drugs combination prescribed throughout the 10 years was β -blocker and CCB

Table 3 shows the BP control rates in patients with hypertensive with or without diabetes over the last 10 years. Overall, BP control improved from 15.6% to 20.0 % after five years and further increased to 43.7% at the end of 10-years. However, the blood pressure control was still very poor among hypertensive patients with underlying diabetes achieving only 11.9% at the end of 10-year. Over the time, we observed more antihypertensive agents were required to achieve target. Nearly one drug is needed to be added in to achieve the same target.

Table 1. Characteristics of hypertensive patients in UMMC (N=822) at baseline

Variables	Total	Value
Mean Age in 1998, years	822	57.2 \pm 9.6
Mean BMI in 1998, kg/m ²	623	27.1 \pm 4.6
Male gender, n (%)	822	303(36.9)
Race, Chinese, n (%)	822	405(49.3)
Malays, n (%)	822	216(26.3)
Indian, n (%)	822	188(22.9)
Co- morbidities, n (%)		
Diabetes	822	262(31.9)
Dyslipidaemia	822	63(7.7)
Obesity	623	244(39.8)
Coronary heart disease	822	78(9.5)
Cerebrovascular accident	822	35
Chronic kidney disease	765	187
Peripheral arterial disease	822	2
Heart failure	822	3

Table 2. Antihypertensive prescribing patterns over the last 10-years in UMMC

	1998	2002	2007
Mean systolic BP (mmHg)	146 \pm 18	143 \pm 17	136 \pm 16
Mean diastolic BP (mmHg)	87 \pm 10	84 \pm 9	80 \pm 9
Monotherapy (n, %)	611 (74.3)	380 (46.2)	205 (24.9)
Two drugs (n, %)	185 (22.5)	351 (42.7)	382 (46.5)
\geq Three drugs (n, %)	13 (1.6)	77 (9.4)	221 (26.9)
Frequency of drugs prescribed overall			
β -blockers (n, %)	433 (52.7)	450 (54.7)	432 (52.6)
CCB (n, %)	349 (42.5)	413 (50.2)	515 (62.6)
Diuretics (n, %)	102 (12.4)	231 (28.1)	299 (36.4)
RAS (n, %)	90 (10.9)	184 (22.4)	379 (46.1)
α -blockers (n, %)	46 (5.6)	39 (4.7)	39 (4.7)

BP: blood pressure; CCB: calcium-channel Blocker; RAS: renin-angiotensin system

Table 3 Control rate among patients with hypertension over the last 10-year

	1998	2002	2007
BP controlled in patients with hypertensive with or without diabetes, n (%)	128/822 (15.6)	164/822 (20.0)	359/822 (43.7)
BP controlled in patients with hypertensive alone, n (%)	123/560 (22.0)	149/458 (32.5)	300/382 (78.5)
BP controlled in patients with hypertensive with diabetes, n (%)	5/262 (1.6)	7/342 (2.0)	50/419 (11.9)
BP controlled in patients with hypertensive with CKD, n (%)	34/187 (18.2)	48/287 (16.7)	138/295 (46.8)
Average number of drugs used in those patients who achieved target BP	1.2	1.2	2.2
on monotherapy, n (%)	103 (80.5)	81(49.4)	85 (23.7)
on two drugs, n (%)	22 (23.2)	68 (41.5)	186 (51.8)
on three drugs, n (%)	2 (1.6)	10 (6.1)	83 (23.1)

CKD: chronic kidney disease

4. Discussions

In this study, although the overall control of BP improved from 15.6. % to 43.7% over a 10-year period, it is far from best practice. However, this result is in keeping with findings even in developed countries where BP control rates varied from 10% to 37% [13, 18-20]. A few possible reasons explain the improvement in BP control seen in this clinic. Firstly, there was a substantial increase by twofold and 17 times in the use of two and three antihypertensive agents respectively over the 10 year period. In parallel, the mean number of drugs needed to achieve target BP also increased. These findings are consistent with previous studies that showed that most patients require two or more drugs to achieve BP control [21-23]. Secondly, this clinic is based in a teaching hospital where there is greater availability of the newer agents which are subsidised. Furthermore, trainees are more likely to adhere to guidelines in achieving BP targets.

In this study, CCB and β - blockers still remain the most frequently prescribed antihypertensive agents. This finding is consistent with studies done in other countries[24, 25]. Nevertheless, there is a decreasing trend in the usage of β - blockers and this most likely is due to the more recent guidelines which no longer recommend it as the first line monotherapy[17, 26] in view of its unfavourable outcomes[27-31].

Although the prescription of ACEI/ ARB increased over time, its use is still low compared to some countries where ACEIs constitute the most frequently prescribed antihypertensive drug class[32, 33]. The use of ACEI was low in this study because while available, its use was heavily controlled in our institution. However, with the availability of generic preparations, we predict that the use of not only ACEI, but ARB will increase dramatically in the next decade. Finally, this is a retrospective study. Some data were missing in particular blood pressure reading, weight and biochemical parameters needed to define chronic kidney disease. However these will not affect our findings in any substantial way.

In conclusion, this retrospective study shows that there is improvement in blood pressure control over time. However there is a further need for improvement. Hopefully this can be achieved in a shorter period of time. Our results indicate that physicians should use at least two or more agents to achieve target BP.

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