

## COST OF TREATING HYPERTENSION IN MALAYSIA

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**Background:** Cost of illness studies approximate the economic burden of any disease on the society. Hypertension is one of the most prevalent vascular diseases and is considered as a main risk factor for cardiovascular diseases. Hypertension is greatly prevalent and severe in Malaysia. Its care is insufficient. Hypertension detection and treatment is less than satisfactory in Malaysia.

**Objective :** This study was conducted to quantify the total direct and indirect costs of hypertension management.

**Methodology :** Data was collected to estimate the direct medical costs for 300 hypertensive patients included health care practitioners' services, medicines and laboratory tests retrospectively and through follow up process. Indirect costs were estimated as productivity lost by hypertensive patients. The prevalence and incidence-based approaches were used to estimate the cost of illness of hypertension disease.

**Results :** The total direct costs were RM1612.38, RM1741.85 and RM2718.21 for the prehypertensive, stage 1 and stage 2 hypertensive groups respectively. The total indirect costs were RM8078.70, RM6654.52 and RM7511.41.

**Conclusion :** The direct costs attributable to hypertension disease were higher in higher blood pressure groups. Direct costs of hypertension are mainly dependant on the costs of antihypertensive agents. Efforts should focus on improving the awareness of the both clinical and economic benefits of preventing hypertension in the society.

**Keywords :** Cost, treatment, hypertension, Malaysia.

## INTRODUCTION

Hypertension or high blood pressure is one of the most prevalent vascular diseases and is considered as a main risk factor for cardiovascular, cerebrovascular, and peripheral vascular diseases that include coronary disease, stroke, peripheral artery disease, renal disease, and heart failure. Hypertension may increase an individual's risk for one of these cardiovascular diseases by about two to three times.<sup>1,2</sup> The cost of treating hypertension takes up a huge and rising share of health care resources.<sup>3</sup>

In Malaysia, the prevalence of hypertension in subjects aged = 15 years was 27.8%. The prevalence increases with age in both genders. Hypertension was more prevalent in males than females in subjects aged 15-39 years. Generally, mean systolic blood pressure was 122 mmHg and mean diastolic blood pressure was 79 mmHg. Both means (systolic 124 mmHg and diastolic 80 mmHg) for males were significantly higher than that for females (systolic 121 mmHg and diastolic 78 mmHg).<sup>4</sup> This study was conducted to estimate the direct and indirect costs attributable to hypertension in Malaysia to better understanding of the economic burden of hypertension as hypertension thought to be one of the most expensive diseases.

## METHODOLOGY

### Study Design

Both, prevalence-based and incidence-based approaches

were used to estimate the cost of illness of hypertension disease.<sup>5,7</sup> The prevalence approach is good for measuring the effectiveness of cost control and how well health care expenditure targets are met.<sup>5, 8</sup> The data were collected retrospectively for patients who were already been diagnosed with hypertension and through follow-up for patients who were diagnosed with hypertension at the beginning of the study.

A cross-sectional study of a cohort of hypertensive patients was conducted to determine health care costs among hypertensive patients according to the hypertension disease stage (prehypertension, stage 1 and stage 2 hypertension). The research's protocol was approved by the Research and Ethics Committee of the Faculty of Medicine in the International Islamic University Malaysia.

The study was conducted in Jaya Gading Poliklinik in Kuantan city, state of Pahang, Malaysia. A total number of 300 hypertensive patients with controlled blood pressure were selected and were considered for this study. Patients were stratified into three blood pressure groups based on the blood pressure classification according to JNC 7. First group included patients with prehypertension, second group included patients with stage 1 hypertension and the third group included patients with stage 2 hypertension. Hypertensive patients were placed in the groups based on their first detected blood pressure reading stated in their medical file or patient case note.

### Data Collection

Three types of data were required and collected using case

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TABLE- 1 Demographic and Clinical Features of Patients in Each Hypertension Category.

	Pre-hypertension	Stage 1 hypertension	Stage 2 hypertension
	Numbers		
<b>Age</b>			
<45	14	21	16
•45	86	79	84
<b>Sex</b>			
Male	25	26	32
Female	75	74	68
<b>Race</b>			
Malay	72	83	84
Others	28	17	16
<b>Smoking</b>			
Yes	12	8	19
No	88	92	81
<b>Alcohol</b>			
Yes	6	4	7
No	94	96	93
<b>Caffeine</b>			
Yes	74	81	88
No	26	19	12
<b>Exercise</b>			
Yes	46	48	40
No	54	52	60
	Mean $\pm$ SD (Median)		
Age	54.5 $\pm$ 9.3 (54.5)	52.3 $\pm$ 9.0 (51.0)	53.7 $\pm$ 10.2 (54.5)
BMI	27.5 $\pm$ 4.8 (27.8)	29.1 $\pm$ 6.34 (28.4)	27.4 $\pm$ 4.6 (28.0)
SBP	116.2 $\pm$ 2.2 (116.5)	116.0 $\pm$ 3.9 (116.0)	115.7 $\pm$ 3.6 (115.4)
DBP	73.2 $\pm$ 4.7 (74.7)	72.1 $\pm$ 5.3 (72.7)	71.9 $\pm$ 5.3 (72.8)
Visits	16.1 $\pm$ 10.4 (13.0)	15.5 $\pm$ 10.7 (13.5)	13.3 $\pm$ 9.4 (11.0)

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, Visits: Number of visits by the patients to the health care center.

TABLE- 2 Estimated Monthly Direct and Indirect Costs (in year-2008 RM) for Hypertensive Patients, Stratified By Blood Pressure Category

	Pre-hypertension	Stage 1 hypertension	Stage 2 hypertension
<b>Direct costs</b>	Mean $\pm$ SD (Median)		
Drugs	8.77 $\pm$ 16.01 (3.35)	9.64 $\pm$ 15.17 (3.82)	19.75 $\pm$ 68.02 (6.02)
Labs	0.94 $\pm$ 0.94 (0.65)	0.99 $\pm$ 1.07 (0.77)	1.08 $\pm$ 1.30 (0.77)
Physician	1.77 $\pm$ 0.83 (1.63)	1.84 $\pm$ 1.22 (1.61)	1.70 $\pm$ 0.74 (1.56)
Pharmacist	1.42 $\pm$ 0.66 (1.31)	1.48 $\pm$ 0.97 (1.29)	1.36 $\pm$ 0.60 (1.25)
Nurse	1.00 $\pm$ 0.48 (0.95)	1.07 $\pm$ 0.71 (0.93)	0.98 $\pm$ 0.43 (0.90)
Transport	2.26 $\pm$ 1.62 (1.70)	2.39 $\pm$ 1.47 (2.00)	2.33 $\pm$ 1.21 (2.08)
Total	16.20 $\pm$ 16.38 (12.19)	17.43 $\pm$ 15.50 (11.86)	27.22 $\pm$ 68.31 (14.05)
<b>Indirect costs</b>	Mean $\pm$ SD (Median)		
Productivity lost	176.59 $\pm$ 86.14 (170.14)	164.73 $\pm$ 75.90 (158.80)	164.39 $\pm$ 73.68 (158.80)

record form and a standard questionnaire. A number of experts in the research fields, (two hypertension specialists and one in pharmacoeconomics) validated the case record form and the questionnaire. An informed consent was prepared in order to help the participants (newly diagnosed patients) to decide whether to participate in the study or

not. The three types of data were collected: demographic (age, sex and race, etc), clinical (stage of hypertension, blood pressure readings, laboratory tests' results, treatment options, etc) and economic (drugs, diagnostic procedures, laboratory tests, physician's, pharmacist's and nurse's, transportation cost, monthly salary, etc) data.

TABLE- 3 Monthly Mean Total Direct Costs

Hypertension stage	Mean $\pm$ SD (Median)	Mean Rank*
Pre-	16.20 $\pm$ 16.38 (12.19)	136.5
Stage 1	17.43 $\pm$ 15.50 (11.86)	145.9
Stage 2	27.22 $\pm$ 68.31 (14.05)	169.08

\*Kruskal-Wallis Test (P &lt;0.024)

### Data Analysis

A variety of descriptive statistics such as mean, standard deviation, median were calculated to describe some parts of the results. Typical health cost data are known to be right-skewed, which in small samples may violate the parametric measures that rely on normal distribution<sup>9,10</sup> and thus nonparametric testing (i.e. Kruskal Wallis) was used to determine the statistically significance differences in mean values for the three hypertension stages. Mann-Whitney test was used to determine the statistically significance differences in means values for the two groups in the gender, race and age groups. Statistical analysis was performed by SPSS-Windows version 12. Results were reported as mean values, standard deviation (SD), median and mean rank. A p value < 0.05 was defined as statistically significant.

### RESULTS

From 1 January to 31 December 2007, 300 patients were enrolled in the study. All of them were diagnosed with hypertension and were receiving at least 1 antihypertensive drug. Data from 300 patients were analyzed; 100 patients were coded as prehypertension group, 100 as stage 1 hypertension group and 100 as stage 2-hypertension group. The mean age was 53.53 (SD 9.58) years; 83% of the patients were  $\geq$  45 years old and the 17% were < 45 years old. The majority of the patients (79.7%) were Malay, followed by others (20.3%). Chinese, Indians and others patients were treated as "Others" in the analysis because of their small percentage in the whole sample. Females represented approximately more than two thirds of the patients (72.3%). The demographic and clinical features of the 600 patients are reported in Table-1.

### Direct costs

Mean total direct costs per patient per month were higher in the higher blood pressure categories as shown in

TABLE- 4 Loss of Productivity Due to Hypertension

Hypertension stage	Mean $\pm$ SD (Median)	Mean Rank*
Pre-	176.59 $\pm$ 86.14 (170.14)	151.82
Stage 1	164.73 $\pm$ 75.90 (158.80)	144.76
Stage 2	164.39 $\pm$ 73.68 (158.80)	154.93

\*Kruskal-Wallis Test (P &lt;0.65)

Table -2. The hypertension related total direct costs per month attributable to prehypertensive, stage 1 and stage 2 hypertensive patients were calculated to be RM 16.20, RM 17.43, and RM 27.22 respectively.

Among the three categories of hypertension, a significant difference in the mean total monthly direct costs was observed (Table 3). These results were significant in both the main analysis and the sensitivity analysis.

### Indirect costs

The value of productivity potentially lost due to absenteeism from work due to hypertension was RM 176.59, RM 164.73 and RM 164.39 for prehypertensive, stage 1 and stage 2 hypertensive patients respectively, as shown in Table 4. There was no significant difference in the total monthly indirect mean costs among the three groups of hypertensive patients.

The total direct costs were RM 1612.38, RM 1741.85 and RM 2718.21 for the prehypertensive, stage 1 and stage 2 hypertensive groups respectively. The total indirect costs were RM 8078.70, RM 6654.52 and RM 7511.41 (Table 5).

### DISCUSSION

Hypertension stands as an important spot of worry for economic evaluations because of the wide range of issues involved for the individual and society. It is one of the most expensive diseases as far as treatment is concerned, as it generates higher health care expenses than those produced by individuals with normal blood pressure.<sup>11</sup> Additionally, despite the existing guidelines for the treatment of hypertension, its treatment is inadequate in a large number of hypertensive individuals in Malaysia,<sup>4</sup> therefore causing major organ damages, mainly in patients with higher or uncontrolled blood pressure. These complications add huge costs to the overall cost of health care; developments in the hypertension treatment process

TABLE- 5 Economic Burden of Hypertension, Malaysia, 2007, Data are in Malaysian Ringgit.

	Pre- (N=100)	%	Stage 1 (N=100)	%	Stage 2 (N=100)	%
Direct costs	1612.38	16%	1741.85	21%	2718.21	27%
Indirect costs	8078.70	84%	6654.52	79%	7511.41	73%
Total	9691.08	100.0	8396.37	100.0	10229.62	100.0

should decrease the occurrence of these complications and consequently improve cost control.

The data collected in this cost of illness study are observational, to be precise, they represent what actually occurs in the real health care practice in Kuantan. Real-world data are necessary for sound coverage, payment, and reimbursement decision. They may offer apparent advantage for understanding outcomes of treatment, for instance, for patients excluded from clinical trials, patients in actual clinical practice settings (vs. research settings), and patients whom treatment is not determined by trial protocol or practice guidelines.<sup>12</sup>

Medications costs are frequently referred to as an important cost driver in the treatment of hypertension.<sup>13, 1</sup> In this study, antihypertensive drugs accounted for 53.7%, 55.1% and 72.4% of the prehypertension, stage 1 and stage 2 hypertension groups total direct cost. Medications costs were the primary cost driver of the total costs.

In this cost of illness study, there was a positive association between blood pressure and personal total monthly medical costs. However, the medical costs attributable to combined pre-hypertensive and stage 1 hypertensive patients were higher than those attributable to stage 2 hypertensive patients.<sup>14,3</sup> Total direct costs were increasing as the blood pressure category increases.<sup>14</sup>

Physician costs were higher in the prehypertension and stage 1 hypertension groups in comparison to stage 2 hypertension group. The comparatively high physician costs may be explained relatively by the fact that hypertension was newly diagnosed in these patients compared to patients with stage 2 hypertension.<sup>15</sup>

From an individual patient point of view, medical costs increase as blood pressure increases. Nevertheless, from the point of view of the whole hypertensive population, prehypertension and stage 1 hypertension has a large economic impact, because the number of prehypertension and stage 1 hypertension patients is much larger than that of patients with stage 2 hypertension. The result of this cost of illness study would expect a reduction in total direct costs of the hypertension population if each patient's blood pressure to become controlled (<140 for systolic blood pressure and < 90 for diastolic blood pressure). This reduction in direct costs can be achieved by changing lifestyle habits for example: reducing dietary sodium intake, decreasing body weight, quitting smoking and reducing alcohol intake.<sup>16</sup> In addition, anti-hypertensive medications can lower the risk of cardiovascular mortality in hypertensive individuals.<sup>17</sup>

The mean total direct costs among the three stages of

hypertension were significantly different and this could be due to the noticeable difference in the health care resources consumed by hypertensive patients in each different blood pressure categories.

In contrast to other studies,<sup>14,3</sup> this study the total direct costs for men seem to be higher than those for women. A possible but purely provisional explanation is that women are more frequent users of health care, and hence their high blood pressure is detected and drug therapy is initiated and blood pressure is controlled in contrast to men who are normally unaware of their blood pressure which is not controlled and thus seeking more health care interventions to control the blood pressure leading to higher direct costs. Another reason might be considered is that, the female subjects represented the majority of the study subjects, which will affect the mean cost for the female category. The indirect costs attributable to hypertension were higher in prehypertension group than in the other two groups (stage 1 and stage 2 hypertension) as shown in. This can be explained by the fact that, newly diagnosed hypertension patients might be visiting health care clinic more frequently than those who are in other blood pressure groups. Therefore they tend to be absent from their work places more often than other hypertensive patients (stage 1 and stage 2 hypertension) who are already on regular follow up visits.

In spite of its limitation, this cost of illness study may be the first to estimate both the direct and indirect costs associated with hypertension in Malaysia. Although the accuracy of the estimates maybe limited, it represents one conservative method for determining the potential magnitude of the economic burden imposed by hypertension disease. Since the identification of an appropriate sample size is an important issue concerning study design when testing an economic hypothesis, as well as an enough and adequate length of follow up, this study should be considered as preliminary, nevertheless we believe that it represents a useful step towards the evaluation of the true cost of hypertension.

## CONCLUSION

Hypertension treatment for the large number of people in Malaysia creates an economic burden on health care budgets and the whole nation economy. Cost of illness studies are useful to estimate the actual direct and indirect costs attributable to hypertension treatment. In spite of its limitation, this cost of illness study is the first to estimate both the direct and indirect costs associated with hypertension in Malaysia.

The direct costs attributable to hypertension disease were

increased as hypertension severity increase. In addition, direct costs of hypertension were mainly dependant on the antihypertensive agents' costs. They were significantly different among the three stages of hypertension. Indirect costs were the highest in the prehypertension group of patients followed by stage 1 and stage 2 hypertension. The difference between the indirect costs among the three stages was insignificant. High efforts should be made and taken to prevent hypertension in order to reduce medical costs that are directly related to hypertension. Efforts should focus on improving the awareness of the both clinical and economic benefits of preventing hypertension in the society.

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