











# Factors Associated with Uncontrolled Hypertension Among Hypertensive Patients Reported from Different Primary Health Clinics in Tuaran, Sabah, Malaysia: A Cross Sectional Study

## Tuaran, Sabah, Malezya'daki Farklı Birinci Basamak Kliniklerindeki Hipertansif Hastalarda Kontrolsüz Hipertansiyonla İlişkili Faktörler: Kesitsel Bir Çalışma

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**ABSTRACT Objective:** Hypertension is a major global issue and in an increasing trend. A disproportional balance between blood pressure controls among treated hypertensive patients is a challenge in public health as uncontrolled hypertension is the main contributor to cardiovascular, cerebrovascular and kidney diseases. Aims of the study are to determine the prevalence of uncontrolled hypertension and associated factors among hypertensive patients attending hypertension clinic at primary health clinics in Tuaran district. Justification of this study is uncontrolled hypertension causing high morbidity and mortality including premature death. **Material and Methods:** Study included 460 participants; is a cross-sectional study among hypertensive patient registered at three primary health clinics in Tuaran district, Sabah. Data were collected using structured modified questionnaires and analyzed using SPSS version 24.0. **Results:** Prevalence of uncontrolled hypertension was 45.9%. The study found that male gender (OR 2.1, 95% CI: 1.442, 3.061), high BMI status (OR 1.975, 95% CI: 1.305, 2.990), presence of diabetes mellitus (OR 3.436, 95% CI: 2.104, 5.613) and lower medication adherence (OR 1.834, 95% CI: 1.256, 2.678) were significantly associated with uncontrolled hypertension with  $p < 0.05$ . **Conclusion:** The prevalence of uncontrolled hypertension in this study population was high with nearly half of the study population had uncontrolled hypertension. Combination of associated factors such as obesity, diabetes mellitus and lower hypertensive medication compliance had a higher impact on uncontrolled hypertension among the study group. This study further needed to address an attitudinal change, extra guidance, coaching and empowerment in the treatment of hypertension.

**Keywords:** Hypertension; blood pressure; prevalence; smoking, diabetes mellitus; obesity; body mass index

**ÖZET Amaç:** Hipertansiyon önemli bir global sorundur ve artma eğilimindedir. Kontrolsüz hipertansiyon kardiyovasküler, serebrovasküler ve böbrek hastalıklarına katkıda bulunan başlıca faktör olduğu için tedavi alan hipertansif hastalarda kan basıncı kontrolleri arasındaki orantsız denge halk sağlığı için zorlayıcı bir durumdur. Bu çalışmanın amaçları Tuaran bölgesindeki birinci basamak kliniklerindeki hipertansiyon kliniğine başvuran hipertansif hastalarda kontrolsüz hipertansiyonun prevalansının ve ilişkili faktörlerin belirlenmesidir. Bu çalışmanın gerekçesi kontrolsüz hipertansiyonun erken ölüm dahil yüksek morbidite ve mortaliteye neden olmasıdır. **Gereç ve Yöntemler:** Çalışmaya 460 katılımcı alınmıştır; Tuaran bölgesi, Sabah'da üç birinci basamak kliniğine kayıtlı hipertansif hastalarla yapılan kesitsel bir çalışmadır. Veriler yapılandırılmış modifiye anketlerle toplanmıştır ve SPSS 24.0 ile değerlendirilmiştir. **Bulgular:** Kontrolsüz hipertansiyonun prevalansı %45.9 idi. Erkek cinsiyetin (OO 2.1, 95% GA: 1.442, 3.061), yüksek BKİ (beden kitle indeksi)'nin (OO 1.975, %95 GA: 1.305, 2.990), diyabetes mellitus varlığının (OO 3.436, %95 GA: 2.104, 5.613) ve düşük ilaç uyumunun (OR 1.834, %95 CI: 1.256, 2.678) kontrolsüz hipertansiyonla anlamlı ilişkisi olduğu bulunmuştur ( $p < 0.05$ ). **Sonuç:** Bu çalışma popülasyonunda kontrolsüz hipertansiyon prevalansı yüksek bulunmuş olup çalışma popülasyonunun yaklaşık yarısının kan basıncı kontrolde değildir. Obezite, diyabetes mellitus ve hipertansif tedaviye düşük uyum gibi ilişkili faktörlerin kombinasyonunun çalışma grubunda kontrolsüz hipertansiyona daha fazla etkisi olduğu bulunmuştur. Bu çalışmada ayrıca hipertansiyon tedavisinde bir tutum değişikliği, ekstra rehberlik, koçluk ve güçlendirme konuları ele alınmıştır.

**Anahtar Kelimeler:** Hipertansiyon; kan basıncı; prevalans; sigara içme; diabetes mellitus; obezite; beden kitle indeksi

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Peer review under responsibility of Türkiye Klinikleri Journal of Medical Sciences.

**Received:** 02 May 2019

**Received in revised form:** 08 Oct 2019

**Accepted:** 11 Nov 2019

**Available online:** 25 Nov 2019

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Hypertension is a condition in which the blood vessels have persistently raised pressure. Its prevalence has been increasing since a decade ago and becomes a global burden of disease as it is a major cause for cardiovascular, cerebrovascular and renal impairment. Worldwide, hypertension affected one billion people.<sup>1</sup> According to several studies, the rate of uncontrolled blood pressure among hypertension is widely varied among different countries, ranging from 48.8% in the United States, 62% in Western Europe, 98% in Eastern Europe, more than 95% in China, and 82% in Iran.<sup>2,3</sup>

Among the Southeast Asian countries, Malaysia has the highest prevalence of hypertension, followed by Singapore, Indonesia, and Thailand.<sup>4</sup> According to the National Health Morbidity Survey (NHMS) 2015, the prevalence of hypertension in Malaysia among adults of age 18 years and above was 30.3%, which is about 6.1 million Malaysian were affected with hypertension.<sup>5</sup> However, based on the Ministry of Health of Malaysia, only 35% of patients have achieved blood pressure control (BP <140/90 mm Hg).<sup>6</sup> Likewise, the National Health Morbidity Survey 2010 stated that only 26.6% of those who are on antihypertensive had their hypertension under control.<sup>7</sup>

According to the National Morbidity and Health Survey 2015, the prevalence of hypertension in the state of Sabah was 26.8% and the prevalence of known hypertension was 12.9% in the same study.<sup>6</sup> It is the highest non-communicable disease in Sabah, with Tuaran district reported having the second-highest number of uncontrolled hypertension patients among newly diagnosed hypertension.<sup>8</sup> This disproportionate of blood pressure control correlates with several studies in Peninsular Malaysia which showed the prevalence of uncontrolled blood pressure among treated patients were ranging from 40% to 80%.<sup>9-11</sup>

Based on American Heart Association (AHA), hypertension is defined as blood pressure  $\geq$  130/80 mmHg. In addition, a patient is diagnosed as hypertension stage I if blood pressure  $\geq$  130/80 mmHg and hypertension stage II if blood pressure  $\geq$  140/90 mmHg.<sup>12</sup> Essential hypertension or also known as primary hypertension caused 95% of hypertension cases with an unknown cause. On the other hand, secondary hypertension is hypertension caused by other diseases such as kidney disease.

Reasons for uncontrolled blood pressure are complex and vary across the countries and each population has different determinants in blood pressure control. Patient-related factors, healthcare systems, and geographical factors are common in contributing to uncontrolled blood pressure. Therefore, this study is conducted to evaluate and to explore the possible narrow gap in the knowledge on the factors associated with uncontrolled hypertension in Tuaran district, concentrated on patient's socio-demographic and socio-economic factors, anthropometry measurement, presence of diabetes mellitus (DM), and medication adherence together with the number of antihypertensive prescribed as associated factors to uncontrolled blood pressure. Nevertheless, unhealthy life behaviour (smoking and alcohol) statuses are also included.

## MATERIAL AND METHODS

This is a cross-sectional and clinic-based study to determine the prevalence of uncontrolled hypertension and associated risk factors in patients who were admitted to hypertension clinic at primary health clinics in Tuaran district of Sabah from 15<sup>th</sup> March to 15<sup>th</sup> May 2018. The study population was adult hypertensive patients who were registered under the hypertension clinic at three health clinics in Tuaran district, aged 18 years and above. Sample size calculation for the study was calculated using the formula by Daniel as below:<sup>13</sup>

$$n = \frac{Z^2 P (1-P)}{d^2}$$

Where,

n = sample size

Z = Z statistic for a level of confident P=expected prevalence or proportion

d=precision (in proportion of one, if 5%-d= 0.05)

The selection was based on convenience random sampling method. A total of 460 samples were collected from three different Health Clinics in Tuaran District. Inclusion criteria were as follows: Diagnosis of hypertension, age  $\geq$  18 years, had at least six months follow up before, at least one type of medication. Exclusion criteria were being pregnant having, mental problems and hypertensive emergency or severely ill patients of any other cause including cardiovascular

disease (CVD) emergencies. Informed consent was also obtained from each respondent before the study.

Associated variables in this study include patient's blood pressure, age, gender, ethnicity, marital status, education level, income status, smoking habit, alcohol habit, body mass index (BMI), waist circumference, presence of DM and medication adherence.

A structured validated questionnaire was used in this study to obtain respondent's information. The questionnaire was composed of six parts; part A; basic information, part B; socio-demographic characteristics including age, ethnicity, gender, marital status, education level and income status. Part C; Lifestyle behavior including smoking status and alcohol consumption status. Part D; physical examination including blood pressure measurement; systolic-diastolic blood pressure (mmHg), height (m), weight (kg) and waist circumference (cm). Part E; co-morbidity status, Part F; medication adherence that included 8 questions. The validated 8-Morisky Medication Adherence Scale (MMAS-8) was administered to solicit information on medication adherence. The questionnaire was in English and Bahasa Malaysia.

This study was performed following the Principles of the Helsinki Declaration and ethical clearance was obtained from the Medical Ethical Committee of University Malaysia Sabah dated 9/2/2018 and numbered JKEtika 1/2018 (32).

The data analysis was done using SPSS version 24.0. Descriptive data were expressed as mean  $\pm$  standard deviation (SD). Categorical data which is an association between categorical variables and uncontrolled hypertension status was analysed using Chi-square test. For all analysis, a value of  $p < 0.05$  was considered as statistically significant.

## RESULTS

A total of 460 patients recruited from three different Health Clinics in Tuaran district were included in the study. Patients were categorized into uncontrolled and controlled hypertensive which followed the Malaysian Hypertension Guideline book. Out of the total patients, 249 (54.1%) had well-controlled blood pressure values and 211 (45.9%) did not have their blood pressure under control. Therefore, the preva-

lence of uncontrolled hypertension in this population was 45.9%. Mean systolic blood pressure was 134.34 mmHg (SD  $\pm$ 12.91) and mean diastolic blood pressure was 77.27 mmHg (SD  $\pm$ 9.73). Out of the total participants, the majority were women (57.6%), between the ranges of 50-69 years who were the dominant age group in the study (56.3%). The youngest participant's age was 28 years and the oldest was 93 years. Kadazan-Dusun (85.9%) were the main ethnicity in the study population. Marital status, education level and personal income were grouped as socioeconomy status that was considered along within this study. It was found that most of the participants (96.3%) were married and had low personal monthly income less than RM 1000 (70.9%). Majority of the participants in this study had a secondary level of education (41.1%). The sociodemographic and socioeconomic characteristics of the participants enrolled in this study were shown in Table 1.

**TABLE 1:** Sociodemographic and socioeconomic characteristics of the participants.

Variables	Category	Frequency (%)
Age	18-29	1 (0.2)
	30-39	23 (5.0)
	40-49	66 (14.3)
	50-59	124 (27)
	60-69	135 (29.3)
	70-79	87 (18.9)
	>80	24 (5.2)
Gender	Male	195 (42.4)
	Female	265 (57.6)
Ethnicity	Kadazan-Dusun	395 (85.9)
	Bajau	38 (8.3)
	Chinese	8 (1.7)
	Malay	1 (0.2)
Marital status	Married	443 (96.3)
	Single	5 (1.1)
	Widow/widower	12 (2.6)
Education level	Non-formal	106 (23)
	Primary	136 (29.6)
	Secondary	189 (41.1)
	Tertiary	29 (6.3)
Income	<1000	326 (70.9)
	1001-2000	85 (18.5)
	2001-3000	24 (5.2)
	3001-4000	8 (1.7)
	4001-5000	4 (0.9)
	>5000	13 (2.8)

Thirteen independent variables were included in this study and association with uncontrolled hypertension was tested using the Chi-square test. Unadjusted odds ratios were obtained to identify factor predictive of uncontrolled hypertension, the outcome variable. Among all sociodemographic and socioeconomic variables, only gender showed a significant association with uncontrolled hypertension (Table 2, Table 3).

Out of the 460 participants, 21.1% reported that they are smoking/and had smoked earlier in

their life, 78.9% reported that they never smoked. Of the patients, 38.3% reported to use alcohol and 61.7% reported that they never drink alcohol or never drank earlier in their life. From the interview and record books, 20% of the participants had hypertension with concomitant DM and 80% were diagnosed with hypertension alone. BMI was calculated from weight in kilogram divided by squared height in meter. They were categorized into four groups; underweight, normal, overweight and

**TABLE 2:** Bivariate analysis of sociodemographic and socioeconomic data with uncontrolled hypertension.

Variables	Overall sample (N = 460)		OR (95% CI)	p-value (95% CI)
	Uncontrolled BP Yes	No		
<b>Age</b>				
< 60 years old	101 (47.2%)	113 (52.8%)	1.105	0.594
≥ 60 years old	110 (44.7%)	136 (55.3%)	(0.765, 1.596)	
<b>Gender, n (%)</b>				
Female	101 (38.1%)	164 (61.9%)	2.101	<0.001
Male	110 (56.4%)	85 (43.6%)	(1.442, 3.061)	
<b>Race, n (%)</b>				
Others	37 (56.9%)	28 (43.1%)	0.596	0.540
Kad-Dusun	174 (44.1%)	221 (55.9%)	(0.351, 1.012)	
<b>Marital status, n (%)</b>				
Married	204 (46%)	239 (54%)	0.820	0.692
Unpartnered	7 (41.2%)	10 (58.8%)	(0.307, 2.193)	
<b>Family income, n (%)</b>				
< RM1000	62 (46.3%)	72 (53.7%)	0.978	0.912
≥ RM1000	149 (45.7%)	177(54.3%)	(0.653, 1.463)	
<b>Education level, n (%)</b>				
≥ Primary	166 (46.9%)	188 (53.1%)	0.835	0.912
Non-formal	45 (42.5%)	61 (57.5%)	(0.539, 1.295)	

BP: Blood pressure, OR: Odds ratio, RC: Reference category of the risk factor.

p-value <0.05 consider statistically significant.

**TABLE 3:** Logistic regression analysis of sociodemographic and socioeconomic data with uncontrolled hypertension.

Demographic profile	B	S.E.	Wald	p-value	OR	95% CI for OR	
						Lower	Upper
Age	-.069	.213	.104	.747	.934	.614	1.418
Ethnicity	-.504	.275	3.344	.067	.604	.352	1.037
Gender	-.475	.199	5.692	.017	.622	.421	.919
Marital status	-.047	.504	.009	.926	.955	.355	2.566
Monthly income	-.209	.227	.852	.356	.811	.520	1.265
Level of education	.205	.262	.609	.435	1.227	.734	2.051

OR: Odds ratio, CI: Confidence interval, B: Estimated logit coefficient, SE: Standard error of the coefficient.

**TABLE 4:** Bivariate analysis of risk factor and uncontrolled hypertension.

Overall sample (N = 460)				
	Uncontrolled BP		OR (95% CI)	p-value (95% CI)
	Yes	No		
<b>Smoking habit, n (%)</b>				
Smoker	53 (54.6%)	44 (45.4%)	1.563	0.051
Not smoker	158 (43.5%)	205 (56.5%)	(0.996, 2.452)	
<b>Alcohol, n (%)</b>				
Consumer	109 (47.2%)	121 (52.8%)	1.088	0.662
Non-consumer	104 (45.1%)	126 (54.9%)	(0.746, 1.586)	
<b>Diabetes mellitus, n (%)</b>				
Yes	64 (69.6%)	28 (30.4%)	3.436	<0.001
No	147 (39.9%)	221 (60.1%)	(2.104-5.613)	
<b>Abdominal obesity</b>				
Yes	134 (49.3%)	138 (50.7%)	1.40	0.079
No	77 (41.0%)	111 (59.0%)	(0.962, 2.038)	
<b>Body mass index, n (%)</b>				
Normal & underweight	47 (34.3%)	90 (65.7%)	1.975	
Overweight and obesity	164 (50.8%)	159 (49.2%)	(1.305-2.990)	0.001
<b>MMAS-8</b>				
≥ Medium adherence	71 (37.2%)	120 (62.8%)	1.834	0.002
Low adherence	140 (52.0%)	129 (48%)	(1.256-2.678)	

BP: Blood pressure, OR: Odds ratio, CI: Confidence interval, MMAS-8: 8-Morisky Medication Adherence Scale.  
p-value <0.05 consider statistically significant, RC: Reference category of the risk factor.

**TABLE 5:** Logistic regression analysis of risk factor and uncontrolled hypertension.

Risk factors	B	S.E.	Wald	p-value	OR	95% CI for OR	
						Lower	Upper
DM	1.253	.256	23.870	.000	3.499	2.117	5.784
Smoking habit	.231	.271	.724	.395	1.259	.740	2.143
Alcoholism	-.109	.228	.228	.633	.897	.574	1.402
BMI	.039	.268	.022	.883	1.040	.615	1.760
Abdominal obesity	.335	.214	2.458	.117	1.398	.920	2.125

CI: Confidence interval, OR: Odds ratio, DM: Diabetes mellitus, BMI: Body mass index, B: Estimated logit coefficient, SE: Standard error of the coefficient.

obese according to the Malaysia Guideline on Management of Obesity 2004. Most of the participants were overweight (51.1%) and had abdominal obesity (59.1%) (Table 4, Table 5).

## DISCUSSION

The prevalence of uncontrolled hypertension in this study population was 45.9%. This figure was considered high and in line with several studies conducted in Peninsular Malaysia. In an observational national study conducted in different states in Malaysia, Ram-

pal and colleagues showed a high prevalence of uncontrolled hypertension, and similarly another study conducted at teaching hospital of Hospital University Sains Malaysia (HUSM) also showed that about half of the participants were reported to have uncontrolled blood pressure.<sup>14,15</sup>

Within sociodemographic and socioeconomic factors, only gender showed a significant association with uncontrolled hypertension in the study. Other studies that showed a significant association between male gender and uncontrolled hypertension as re-

ported in the US, Sudan and Iran and recently reported in Malaysia by Abdul Razak et al. This data suggests the importance of raising hypertension awareness as well as controlling hypertension in males.<sup>9,16-18</sup> The possible reason among female gender with better control on hypertension is proved due to the protective and regulatory effect of the hormone estrogen. In addition, males were reported to be less likely to seek medical attention compared to females in case of hypertension.<sup>17</sup> Their lack of time to adopt a healthy lifestyle, enjoyment to be among fellow smokers and men's perception of invulnerability to illness also contributed towards the problem.<sup>9</sup> This study suggests the importance of raising hypertension awareness as well as controlling hypertension in males.

On the other hand, we found that participants with concurrent DM have a significant association with uncontrolled blood pressure in this study. A study in the state of Kelantan showed uncontrolled hypertension was common among one-half of diabetes patients.<sup>15</sup> Another study in Lupane district of Zimbabwe also showed a similar finding where hypertensive patients with DM having a 4.5 risk of uncontrolled blood pressure compared to non-diabetic patients.<sup>19</sup> In this study, concomitant diabetes with hypertension showed a 3.4-fold risk of uncontrolled blood pressure.

Overweight and obesity were known as significant independent risk factors for uncontrolled hypertension as proved by several studies globally. There are overlaps and interrelationship in disease etiology and mechanism between obesity, inflammation and oxidative stress in hypertension and obesity that contributed to uncontrolled hypertension. Overweight and obesity were found to show a significant difference with uncontrolled hypertension with a p-value of 0.001. The risk to have uncontrolled hypertension is about 1.8-fold greater compared with normal BMI. This finding was similar to several earlier studies by Babiker, Arabzadeh and Decoste.<sup>17,18,20</sup> As the combination of these two conditions showed early complications if not well controlled, thus preventive measures should be concentrated on these patients.

In this study, low adherence to medication and 2 types and above of antihypertensive drugs prescribed have significantly associated with uncontrolled hyper-

tension. This finding correlates with many studies done at Hospital Kuala Lumpur by Ling and Yeow.<sup>21</sup> The side effect of antihypertensives such as fatigue, sexual dysfunction and frequent urination are some barriers in long term treatment of hypertension, and a fact that hypertension is a silent disease makes patients having low adherence to medication.<sup>22</sup> This was accompanied by the number of antihypertensives prescribed to the patients. The higher number of antihypertensive drugs prescribed were more likely to cause lesser compliance.

Some limitations observed during this study were a possible selection bias and a high level of sampling error due to convenience random sampling. The coverage of this study was also limited to only three government health clinics which may not describe the overall picture of hypertension in Tuaran. At the same time, there could be a possible social desirability bias on the questions such as smoking and alcohol consumption which might be under-reported due to the personal reasons by the participants.

In conclusion, the prevalence of uncontrolled hypertension in this study was high with nearly half of the study population had uncontrolled hypertension. The reasons for the suboptimal blood pressure control were the presence of DM, overweight and obesity and male gender. Combination of these factors requires extra guidance, coaching and empowerment in the treatment of hypertension. At the same time, lifestyle modification is very essential to minimize complications of uncontrolled hypertension among these patients.

#### **Source of Finance**

*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

#### **Conflict of Interest**

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea/Concept:** Rosfina Ghazali, Khamisah Awang Lukman, Daw Khin Saw Naing; **Design:** Rosfina Ghazali, Khamisah Awang Lukman, Daw Khin Saw Naing; **Control/Supervision:** Khamisah Awang Lukman, Daw Khin Saw Naing, George George Mathew; **Data Collection and/or Processing:** Rosfina Ghazali; **Analysis**

**and/or Interpretation:** Rosfina Ghazali, Khamisah Awang Lukman; **Literature Review:** Rosfina Ghazali; **Writing the Article:** Fairrul Kadir, Urban John Arnold D'souza; **Critical Review:** Mohammad Saffree Jeffree, Freddie Robinson, Nelbon Giloi, Mohammad Yusof Ibrahim; **Reference and Findings:** Rosfina Ghazali, Khamisah Awang Lukman, Daw Khin Saw Naing.

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