ASM Sc. J., 17, 2022

https://doi.org/10.32802/asmscj.2022.647

Prevalence and Associated Risk Factors of Hypertension Among Rural Communities in Kudat Sabah, East Malaysia

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Approximately a third of Malaysian adult has been diagnosed with hypertension. This study aimed to investigate the prevalence and key risk factors of hypertension in a community living in a rural area of Kudat, Sabah. Methods: The study included participants of at least 18 years old, able to communicate in the local dialect, no mental disability, not pregnant or lactating and no known cause of secondary hypertension. Sociodemographic data were recorded in addition to assessment of depression, anxiety, stress, and dietary salt of the participants using standard DASS-21 questionnaire (Depression Anxiety Stress Scales standard questionnaire) questionnaire. Multiple logistic regression analyses were used to assess the association of hypertension and health-related variables predicted to be a risk factor. Results: Out of 111 participants, 30% were diagnosed with hypertension of which 60.6% were not aware of their health condition. Among the variables analyzed, higher age (at least 40 years old) and excess BMI (≥23.0) highly contributed to the predisposition of hypertension (p<0.05). Other variables such as gender, marital status, education level, physical activity, stress level, and household income were not associated with hypertension (p>0.05). Conclusion: The community in Kudat, as a representation of the rural population in Sabah, has a high prevalence of hypertension, implying that lifestyle changes and regular health checks are effective interventions to minimise the risk of hypertension.

Keywords: rural community; hypertension; risk factors; indigenous people of Sabah; health screening disparity

I. INTRODUCTION

The World Health Organization (WHO) has estimated that one in every 10 adults aged 25 years old and above are at risk of hypertension worldwide (WHO, 2019). The prevalence of hypertension in several Asian countries is alarmingly high, with the cases are above the global average (Mohammed Nawi *et al.,* 2021). According to a previous National Health and Morbidity Survey (NHMS) reports, nearly one-third of Malaysian people are hypertensive (30.3% in 2015 and 30.0%

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in 2019, respectively) (NHMS, 2014; NHMS, 2019). It is well-known that the rising prevalence of hypertension is a growing public health concern due to its associated complications, including myocardial infarction, congestive heart failure, aortic aneurysm, stroke, and chronic kidney diseases (Mandago & Mghanga, 2018). A recent report on an analysis of trends from Malaysian national surveys from 1996 to 2011 shows a rising trend in the prevalence of hypertension in adults under 30 years: 32.9% in 1996, 42.6% in 2006, and 43.5% in 2011 (Naing *et al.,* 2016). Thus, there is an urgent need to investigate the risk factors that may predispose Malaysian adults to be hypertensive to have a better strategy to reduce its prevalence.

Several studies have reported risk factors associated with hypertension such as age, obesity (Webster *et al.,* 2018), ethnicity, urban population, smoking, alcohol consumption, stress, and occupation (Neupane *et al.,* 2014). However, these factors are not consistent across the countries or populations since they differ in demographics, notably ethnicity, and socioeconomic status. Sabah is a state in East Malaysia that has a unique and diverse ethnic group, cultures, and beliefs. There are an estimated 42 ethnic groups with over 200 sub-ethnic groups present in Sabah. The cultures are particularly influenced by Christianity that have a greater impact on the daily lives of the Kadazan-Dusun and Murut ethnics, while the Bruneian and Bajau ethics with Islam being an important part of their lives. In Kudat, the influx of Bajau Laut (also known as “Badjao”) migrants from the Philippines and merge with the indigenous Bajau ethnic population produced their own cultural values which has an important role in their lives. Historically, the Bajau Laut and the Bajau Tempatan ("Bajau"), who are Malaysian citizens, shared similar ancestors from the southern Philippines (Acciaioli *et al.,* 2017). Inter-racial marriages between these two groups are prevalent, which is not surprising given their cultural similarities.

Many parts of Sabah are still considered as rural and low income in terms of development. Indigenous peoples are often facing substantial health issues, such as limited access to health care, cultural and social beliefs in traditional medicines, and the use of modern technology in disease diagnosis and treatment, similar to those reported in other countries or rural populations (Vargese *et al.,* 2020). To date, limited reports are available to present the evidence on the prevalence or related risk factors of hypertension, which includes a high-salt diet, obesity, stress, and alcohol consumption. A recent study carried out by Harris *et al.* on non-communicable diseases, including hypertension among rural coastal communities in Semporna, Sabah showed that the prevalence of hypertension is 24.5% (Harris *et al.,* 2019).

Despite the data on hypertension in Sabah is available, however, comprehensive data that include several regions and different ethnicities are essential to truly reflect the selected indicator of health status of a rural community in Sabah. These ethnicity and cultural diversities indicate Sabah is an interesting area to be investigated. Given these factors, an epidemiological study on hypertension should be conducted in a relevant rural location, such as Kudat in Sabah, which has a diverse socio-cultural background and religious practices, and compared to other studies involving rural populations in order to improve hypertension planning and management in Limau- Limauan, Kudat. Therefore, this study aimed to evaluate and determine the prevalence and associated risk factors of hypertension among the rural population in Kudat, Sabah.

II. METHODS

A. Ethics Approval

The study was approved by the Ethics and Research Committee, Universiti Malaysia Sabah (UMS) which complies with the Code of Ethics of the World Medical Association (Declaration of Helsinki). All participants were briefed on the study protocol before giving verbal informed consent. Additionally, participants were informed on their rights to withdraw from the study without any penalty and the anonymity of the data.

B. Study Site Description

Kudat is in the northern part of Borneo Island, the third largest non-continental island in the world. Kudat that can be divided into three zones, namely Limauan-Limauan Hujung, Limauan-Limauan Tengah and Limauan-Limauan Pinggir villages. The study site is 45 kilometres from Kudat, the central town, 30 kilometres from a nearby health clinic, and located by the coast. In Sabah, there are an estimated 42

ethnic groupings and approximately 200 sub-ethnic groups. Kudat's residents are largely Rungus (a Kadazan-Dusun sub-group) and Bajau ethnicities, who speak a different language and have a few dialects, customs, and clothing. Rungus ethics are known for living in longhouses, whereas Bajau ethnics are skilled fisherman and horseback riders. In later years, the Bajau Laut ethnic began to inhabit Kudat. The inhabitants of Kudat are mostly Rungus and Bajau ethnicities, while the Bajau Laut started to occupy Kudat in the later years.

C. Study Design and Sample Size

This is a cross-sectional survey at Limau-Limauan, Kudatinvolving, a direct field observation. Permission from the village chief was obtained, and a one-week briefing on the survey was provided to the participants. Subsequently, the interviews and measurements were conducted for three weeks at a multipurpose hall or mosque. Based on universal sampling method, any participants who fulfilled the selection criteria (at least 18 years old, able to communicate in Sabah Malay creole, no mental disability, not pregnant or lactating and no known cause of secondary hypertension) were included in the study.

D. Study Instrument

For sociodemographic assessment, data collected includes medical illness, health-related behaviour, maternal and child health, nutritional status, and healthcare services data using a structured questionnaire. Additionally, the study utilised standardised and validated International Physical Activity Questionnaire (IPAQ) (Booth *et al.,* 2003), Depression, Anxiety, Stress Scale 21 (DASS-21) questionnaire (Oei *et al.,* 2013) and dietary salt intake questionnaire by the Ministry of Health Malaysia (MOH Malaysia, 2016) to record health-related information.

E. Data Collections

Data were collected by trained medical students either by interviewer-assisted method or self-administered questionnaire. The use of an interviewer-assisted data collecting method was deemed necessary to assist participants in getting more information on the in-depth questions of IPAQ. Participants were informed to avoid smoking, eating, caffeine intake or exercise for at least 30 minutes before blood pressure (BP) measurement. BP measurements were taken in the sitting posture after a five-minute rest. The participants were comfortably seated on the chair with their feet on the floor and their arms well supported at the level of the heart. BP was measured using a mercury BP measurement set with an appropriate size of cuff bladder (encircling at least 80% of the arm) to ensure an accurate reading. BP was recorded twice within a one-minute gap and was repeated for the third time if the discrepancies between the first two readings are greater than 10mmHg (CPG Malaysia, 2018). The mean BP reading was then calculated arithmetically and was taken as the final reading. A stadiometer (SECA, GmBH, Germany) was used to measure height barefooted, and a calibrated weighing scale was used to assess weight barefooted and with light clothes (SECA, GmBH, Germany). Subsequently, height and weight measured were used to calculate BMI. The participants were referred to a nearby rural health clinic if any abnormalities were discovered.

F. Definition of Terms

Hypertension is defined as a persistent elevation of systolic BP of 140 mmHg or higher and/or diastolic BP of 90 mmHg or higher and/or taking antihypertensive medications. Normotensive was defined as BP values <120/80 mmHg and without taking any antihypertensive medication (Chobanian *et al.,* 2003). Income is defined as gross earnings received, including all sources of compensation and were classified based on the Malaysian Urban-Rural National Indicators Network for Sustainable Development (MURNI) (Shamsuddin, 2013) as follows: a) <RM160.00; b) RM160.00-RM250.00; c) >RM250.00. Smoking habits are divided into three categories: a) active smoker is an adult who has smoked 100 cigarettes and currently smokes cigarettes; b) former smoker is an adult who has smoked at least 100 cigarettes but had quit smoking; c) non-smoker is an adult who has never smoked, or who has smoked less than 100 cigarettes. Stress is defined according to the Depression, Anxiety and Stress Scale (DASS21) score (Lee, 2019) as follows: a) normal (0-14); b) mild (14-18); c) moderate (19-25); d) severe 26-33; e) extremely severe 34 and above. Physical activity level was evaluated based on the

International Physical Activity Questionnaire (IPAQ) scoring protocol, namely: i) high- a vigorous-intensity activity for at least three days to achieve a minimum of 3,000 metabolic equivalents of task (MET) min/week or approximately one hour of activity per day or more with at least a moderate intensity; ii) moderate- five or more days of moderate-intensity activity or achieve 600-2, 999 MET min/week; iii) low: MET of less than 600 min/week. BMI measurement was based on 2004 Malaysia Clinical Practice Guideline (CPG) for obesity (CPG Malaysia, 2018) and were categorised into three groups: i) underweight (<18.5 kg/m^2); ii) normal (BMI (< 18.5-22.9 kg/m^2); iii) overweight (23.0 – 27.4 kg/m^2); iv) obese (≥27.5 kg/m^2). Dietary salt intake is defined as the level of salt intake based on the scoring marks of *Malaysia Manual Penggunaan Bahan Pendidikan Kesihatan, Penjagaan Pemakanan Dalam Pengawalan Pengambilan Garam, 2018* (Shahrir *et al.,* 2019) and are divided into three categories: i) low (0.0-49.9); b) moderate (50.0-79.9); c) high (≥80.0).

G. Statistical Analysis

Data collected were analysed using IBM SPSS Statistics for Windows, Version 20.0. A *p*-value ≤ 0.05 was considered as statistically significant. Univariate logistic regression was performed to explore the association between presence of hypertension and health-related characteristics (smoking, physical activity, BMI, salt intake, stress level) as well as sociodemographic characteristics (age group, gender, ethnicity, and marital status, educational level, occupation, monthly income). Multiple logistic regression analyse was used to identify the significant determinants for presence of hypertension based on the

III. RESULT AND DISCUSSION

To the best of our knowledge, this is the first study to evaluate and determine the prevalence and associated risk factors of developing hypertension in rural communities of Kudat, Sabah. The findings demonstrated that the prevalence of hypertension among rural communities in Kudat Sabah is 30%, which is more prevalent in older adults with older age and higher BMI.

A. Sociodemographic Characteristics

A total of 111 participants (58 females; 53 males) were included in this study. The mean age was 41.9 ± 15.3 years old. The majority of the participants are in the age group of 18-29 years old (25.2%) and described themselves as Bajau ethnic group (57.7%), followed by the Suluk ethnic group (28.8%), which reflects the ethnics composition of the studied area. Of all the participants, more than two-thirds of the participants are married (75.7%). In terms of educational attainment, less than one-third of the participants have tertiary education (8.1%). 81.1% of male were employed and 56.9% of female were unemployed. Among employed male, they work mainly as fisherman which is almost half (46.5%) and a quarter of them (25.6%) as self-employed. Anchovies picking job is the major work among working women (47.8%). Overall, most of the participants claimed to have at least a monthly income of RM250.00 (approximately USD 60). The details of the sociodemographic data are as shown in Table 1.

Table 1. Sociodemographic characteristics of participants

Characteristics	**n, (%)**
Age	
18-29	28 (25.2)
30-39	27 (24.3)
40-49	20 (18.0)
50-59	18 (16.2)
≥60	18 (16.2)
Gender	
Female	58 (52.3)
Male	53 (47.7)
Ethnicity	
Bajau	64 (57.7)
Suluk	32 (28.8)
Others	15 (13.5)
Marital status	
Single	15 (13.5)
Married	84 (75.7)
Divorce	2 (1.8)
Widow	10 (9.0)
Education level	
No schooling	12 (10.8)

Primary school	43 (38.7)
Secondary school	47 (42.3)
Tertiary school	9 (8.1)
Occupation	
Fisherman	21 (18.9)
Government servant	5 (4.5)
Self-employed	16 (14.4)
Anchovies pickers	11 (9.9)
Business	3 (2.7)
Miscellaneous jobs	10 (9.0)
Student	1 (0.9)
Retired	3 (2.7)
Unemployed	41 (36.9)
Household income (RM/month)	
<160.00	5 (7.6)
160.00-250.00	9 (13.6)
≥250.00	52 (78.8)

B. Health-Related Characteristics of Participants

This study found that the prevalence of hypertension of adults in Kudat is relatively higher than those reported in previous studies in Malaysia (ranging from 24.5 to 29.1%), which involved other rural areas (Harris *et al.,* 2019). Moreover, a systematic review analysis done on 56 studies carried out in 1980-2017, which involved 241,796 participants, have indicated a lower prevalence of hypertension (28.2%) in other states of Malaysia (Chow *et al.,* 2019). These findings could be attributed to the low awareness of the health status of Kudat communities most probably due to cultural background and socioeconomic status. Of those participants who were detected to have high blood pressure in our study, only 39.4% were aware that they are hypertensive. Interestingly, this percentage is relatively higher as compared to a study carried in a more developed state in Malaysia, Selangor (31.9%) (Mohammed *et al.,* 2019). More than 50% of the participants had a history of smoking (44.1%), with more than one-third of them had smoked more than and equal to 20 packs of cigarettes. The data collected were interesting because majority of the participants (90.1%) were engaged in at least a moderate level of physical activity and expectedly, with more than one-third of them (39.6%) have normal body weight. Of all the participants, a higher number (62.2%) of participants practised a moderate salt diet, and more than two-thirds of the participants had a normal stress level (81.1%). More detailed information on the health-related characteristics of the participants is as shown in Table 2.

Table 2. Health-related characteristics of the participants

Lifestyles and health characteristics	**n, (%)**
Hypertension status	
Normotensive	78 (70.0)
Hypertensive	33 (30.0)
Smoking habits	
Active smoker	43 (38.7)
Former smoker	6 (5.4)
Non-smoker	62 (55.9)
Physical activity	
Low (<600)	11 (9.9)
Moderate (600-2999)	43 (38.7)
High (≥3000)	57 (51.4)
Dietary salt intake	
Low (0-49)	40 (36.0)
Moderate (50-79)	69 (62.2)
High (80-100)	2 (1.8)
Stress level	
Normal (0-14)	90 (81.1)
Mild (15-18)	10 (9.0)
Moderate (19-25)	9 (8.1)
Severe (26-33)	1 (0.9)
Extremely Severe (≥34)	1 (0.9)
Body mass index (BMI)	
Underweight (<18.5)	11 (9.9)
Normal (18.5-22.9)	44 (39.6)
Overweight (23.0-27.4)	36 (32.4)
Obese (≥27.5)	20 (18.0)

C. Association Of Sociodemographic Characteristics of Participants with Hypertension

Based on the multivariate logistic regression analysis (Table 3(b)), participants who engage in high physical activity are five times less likely to acquire hypertension than those who do not [OR=5.07, 95%CI= 1.05 – 24.42); p=0.043 independently of other possible confounding variables. This finding is consistent with earlier research that has linked physical activity to a lower risk of high (Valenzuela *et al.,* 2021), implying the health benefits of physical activity. Based on our observation, although most of the participants (90.1%) were involved in at least a moderate degree of physical activity, they were predominantly young and middle-aged adult males. On the other hand, older individuals and women, on the other hand, do not participate in any physical activities. It is recommended that the village leaders, through the Jawatankuasa Kemajuan dan Keselamatan Kampung (Village Development and Security Committee), play a significant role in empowering the villagers to adopt healthy lifestyles, such as physical exercise. The Malaysian government recognises the importance of leading a healthy lifestyle, including physical activity and exercise, in combating the rising incidence of hypertension and has implemented The National Strategic Plan for Non-Communicable Diseases (NSP-NCD) and NCD Prevention 1 Malaysia (NCDP-1) in health care facilities across the country (Mustapha *et al.,* 2014). It was also found that increasing in age was found to be significantly associated of having hypertension [OR=7.66; 95% CI=1.74–33.63; p=0.007]. This is unsurprising, given that older age is linked to frailty and stiffness of the main arteries (Orkaby *et al.,* 2019), both of which increase the risk of hypertension (Safar, 2018). It's also worth noting that older persons have several co-morbidities that raise their risk of hypertension. For example, depression and hypertension are prevalent and co-exists illnesses among China's ageing rural population (Chen *et al.,* 2018). Moreover, diabetes, ethnicity, socioeconomic status, and rural residency all predispose people to hypertension, according to a subanalysis of a population-based study done countrywide in Malaysia (Mahadir Naidu *et al.,* 2019). As a consequences of these co-morbidities, the elevation of BP can be induced by the frequent use of drugs such as non-steroidal anti-inflammatory drugs (NSAIDs) that can cause inhibition of cyclooxygenase (COX) production and retention of fluids (Khan *et al.,* 2019). As some participants in this study use NSAIDs, further investigation on the possibility of medication effects on hypertension is needed to have more effective preventive interventions for the rural communities of Kudat, Sabah.

Although the study found that overweight or obese people are more likely to develop hypertension than normal or underweight people [OR=3.14 95 percent CI=1.32–7.47; p=0.010], when other variables were included as in the multivariate logistic regression analysis, this association was no longer significant. This might possibly be due to limited number of samples, with complete information. In the multivariate regression analysis, only 66 participants were included (out of 111) had all information, resulting in much lower statistical significance. Several studies have linked a high BMI to the development of hypertension (Li *et. al.,* 2019; Qaiser *et al.,* 2020), citing well-known processes such as insulin resistance, sympathetic nervous system activation, salt retention leading to increased renal reabsorption, and renin–angiotensin system activation (Crump *et al.,* 2016). Because of the small sample size, inconsistency in recording, and clinical definition for hypertension in the current investigation, the association was not found in the multivariate analysis.

In both univariate and multivariate logistic regression analysis (Table 3(a) and 3(b)), other health-related characteristics (smoking habits, dietary salt intake, and stress levels) and sociodemographic characteristics (gender, ethnicity, marital status, education level, occupation, and monthly income) were not significantly associated with hypertension (p>0.05). Because some of the questions were self-administered, it is possible that the relationship was missed due to under-reporting by the participants. Because most of the participants (more than 90%) had completed secondary school, the degree of knowledge may have an impact on the data reporting.

Table 3(a). Univariate logistic regression on the association of sociodemographic and health-related characteristics with hypertension

Characteristics	**Univariate logistic regression**	
	cOR	***p***
Age	5.20	<0.001*
Gender		
Female	1 (ref)	
Male	1.47 (0.65 – 3.34)	0.352
Ethnicity		
Bajau	1 (ref)	
Suluk	0.53 (0.20 -1.43)	0.212
Others	0.69 (0.20 – 2.43)	0.569
Marital status		
Single	1(ref)	
Married	0.98 (0.28 – 3.38)	0.969
Divorced/Widowed	3.85 (0.76 - 19.47)	0.103
Smoking status		
Never Smoker	1 (ref)	
Ever smoker	1.08 (0.47 - 2.44)	0.857
Physical Activity		
Highly active	1 (ref)	
Low or moderately active	1.67 (0.73 - 3.79)	0.223
Dietary Salt Intake		
Low (0-49 mg)	1 (ref)	0.632
Moderate (50-79 mg) to High (>80 mg)	0.81 (0.35 - 1.89)	
Stress level		
Normal	1 (ref)	
Mild	0.95 (0.23 -3.94)	0.943
Moderate and above	0.49 (0.10 – 2.43)	0.384
Body Mass Index		
Normal or underweight	1 (ref)	
Overweight or obese	3.14 (1.32 – 7.47)	0.010*
Educational level		
Secondary education and above	1 (ref)	
No schooling or Primary school	2.26 (0.98 – 5.24)	0.056
Household Income		
<250	1 (ref)	
> 250	1.94 (0.48 – 7.86)	0.353
Occupation		
Unemployed	1 (ref)	
Employed	1.28 (0.55 -2.97)	0.560

Note: p-value is significant at <0.05; cOR= crude odd ratio; aOR = adjusted odd ratio; ref= reference

Table 3(b). Multiple logistic regression on the association of sociodemographic and health-related characteristics with hypertension

Characteristics	**Multiple logistic regression**	
	aOR	***p***
Age	7.66 (1.74 – 33.63)	0.007*
Gender		
Female	1 (ref)	
Male	1.18 (0.16 – 8.52)	0.871
Ethnicity		
Bajau	1 (ref)	
Suluk	1.29 (0.27 – 6.10)	0.747
Others	1.68 (0.19 – 14.43)	0.638
Marital status		
Single	1 (ref)	
Married	0.33 (0.03 – 3.52)	0.358
Divorced/Widowed	0.90 (0.3 – 25.17)	0.950
Smoking status		
Never Smoker	1 (ref)	
Ever smoker	2.32 (0.35 – 15.19)	0.379
Physical Activity		
Highly active	1 (ref)	
Low or moderately active	5.07 (1.05 – 24.42)	0.043*
Dietary Salt Intake		
Low (0-49 mg)	1 (ref)	0.273
Moderate (50-79 mg) to High (>80 mg)	0.38 (0.069 – 2.12)	
Stress level		
Normal	1 (ref)	
Mild	0.12 (0.01 - 2.82)	0.189
Moderate and above	4.28 (0.45 – 40.07)	0.202
Body Mass Index		
Normal or underweight	1 (ref)	
Overweight or obese	1.27 (0.29 – 5.61)	0.755
Educational level		
Secondary education and above	1 (ref)	
No schooling or Primary school	0.48 (0.10 – 2.26)	0.349
Household Income		
<250	1 (ref)	
> 250	2.93 (0.35 – 24.51)	0.322
Occupation		
Unemployed	-	-
Employed		

Note: *p*-value is significant at <0.05; cOR= crude odd ratio; aOR = adjusted odd ratio; ref= reference

A possible reason for the non-gender disparity to the risk of hypertensive could be partially attributed to the behavioural protective factors against alcohol consumption in this Muslim-dominated area in Kudat, Sabah. Nevertheless, the pattern of association between gender and hypertension is common as evidenced by worldwide data that inconsistent association has been reported across different populations (Kearney *et. al.,* 2005; Kamar *et al.,* 2000). Naidu *et al.* (2019) have reported that ethnicity plays an important role in the development of hypertension, however, such a claim was not seen in our study. The most recent Malaysian nationally representative data on nutrient intake showed that indigenous people in Sabah had a higher median sodium intake (2026 mg) as compared to the national sodium intake (1935 mg) (NHMS, 2014). However, in this study, only a small percentage of the participants consumed 80% above the recommended amount (5 g per day of salt) for adults. However, it is plausible that the majority of the studied population worked as a fisherman or anchovies' pickers, thus predisposing them to hypertension with high consumption of salted fish. Nonetheless, the association of salt intake leading to hypertension is an interesting study for further confirmation. In contrast to some studies (Olack *et al.,* 2015), no significant association was observed between marital status and stress with hypertension. According to WHO (WHO, 2013), those with lower socioeconomic backgrounds have a higher risk of developing mental health problems, including depression, anxiety, and stress, which could lead to an elevation of BP.

One of the weaknesses in conducting surveys is social desirability bias (Bergen & Labonte, 2020), which may have influenced the quality of the data by leaving researchers with incomplete and shallow contextualisation of responses, missing information about weaknesses and barriers, and/or a preponderance of one-sided perspectives. To this purpose, interview-assisted procedures or a survey questionnaire with an open-ended style of questionnaire can lead to fresh discoveries through flexibility, inventiveness, and responsiveness.

The study has some limitations that needed further clarifications. First, due to the short duration for sample collection, the study included lesser number of participants. Moreover, the current study cannot be considered as fully representative of hypertension among Sabahan as the state consists of many ethnicities with a unique culture in different districts of Sabah. Furthermore, a comparative analysis of Sabah ethnicities could not be performed in this study, as Kudat is mainly populated by Bajau and Suluk ethnicities.

IV. CONCLUSION

This study found a 30% prevalence of hypertension in Kudat, representating rural population in Sabah. Worryingly, less than half of the hypertensive participants were aware of and received treatment. The villagers' biggest health concern is a lack of access to healthcare services, including no mobile clinic visits. On the other hand, they have to rely on their own transportation or exchange rides with other villages. This study indicates the importance of visiting nearby health centre for routine health checkup is an effective strategy to detect the risk of hypertension followed by further evaluations at hospital settings.

V. ACKNOWLEDGEMENT

We would like to express our gratitude to the Faculty of Medicine and Health Sciences (FMHS), Universiti Malaysia Sabah for supporting this research. Our uttermost gratitude to the study participants for attending the health promotion program and thereafter participated voluntarily in this survey.

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