Prevalence and Risk Factors for Hypertension: Evidence from Non-communicable Disease Screening Project in Nan Province, Thailand

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Introduction

The current growths in economic and social development in various countries have led to improvements in living conditions, nutritional level and the standard of public health. Medical advances, including the expansion of antibiotics and discovery of new vaccines, have contributed to mortality decline worldwide. These affected the epidemiological transition of the disease patterns. The major health problems were evolved from communicable disease to non-communicable disease, increasing due to culture, life styles and behavior changes in modernization era.

Non-communicable disease accounts for a large and increasing burden of diseases worldwide. It is currently estimated that non-communicable disease accounts for approximately 59 % of global deaths and 43 % of global disease burden; this is projected to increase to 73 % of deaths and 60 % of disease burden by 2020 (World Health Organization, 2000). Cardiovascular disease is the most important single cause of non-communicable disease, accounting in 2001 for 29 % of all deaths and 10 % of the global disease burden (World Health Organization, 2002). Cardiovascular disease is not only the main cause of death worldwide, but also the major cause of disability and morbidity (Bello & Mosc, 2004).

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In Thailand, although communicable diseases still dominate morbidity, the non-communicable morbidity is steadily rising and cardiovascular diseases are becoming major causes of morbidity (Wibulpolprasert et al., 2002). Hypertension is one of the most important risk factors for cardiovascular disease morbidity and mortality, and hypertensive persons had 3.7 times increased in risk for cardiovascular disease (Chooprapavan, 2000). High blood pressure emerged as a critical link in the development of stroke, heart attacks, peripheral vascular diseases, heart failure, kidney failure and blindness (William, 2004; World Health Organization, 2005). Most uncomplicated hypertension is asymptomatic. Unaware cases may be affected for 10 – 20 years. Mortality of cardiovascular disease caused from complication of hypertension can be found at age 40 years. The highest rate was reported at age 60 – 64 years (Chooprapavan, 2000). Likewise, the prevalence of hypertension has increased. In 1996, 1998, 2000, and 2001, the rates were 15.6, 10.3, 18.9, and 24.5 per 100,000 populations (Bureau of Policy and Strategy, 2002).

Hypertension can be classified into 3 types, and the major type is primary or essential hypertension accounted for 90 – 95 % of hypertensive patients (Swales, 1994). Hypertension is a multifactorial disease, developed by a combination of genetic, environmental and lifestyle factors (Kantachuvessiri, 2003). Among the lifestyle risk factors of hypertension, previous studies have listed obesity, excessive salt intake, deficiency in minerals such as potassium, magnesium and calcium, alcohol consumption, smoking, physical inactivity, and psychosocial stress (Nakanishi et al., 2003; William, 2004). Primary prevention of hypertension is an essential component to reduction of morbidity and mortality of cardiovascular disease. According to guidelines of the sixth report of the Joint National Committee on Prevention (JNC VI) in 1997, effective population wide strategies to prevent blood pressure rise with age and to reduce overall blood pressure even by a little would effect overall cardiovascular morbidity and mortality as much if not more than only treating those with established disease. Prevention is a key, and it has become clear that there are very effective ways to accomplish this (Duluth, 2003). In the Ninth Five – Year National Health Development Plan 2000 – 2006 (The Ministry of Public Health, 2004), non-communicable disease control strategy was still emphasized on health promotion and

disease prevention rather than treatment when illness occurred. The strategic plans were included proactive health promotion to improve lifestyle and health behaviors, reduce risk factors and enhance health promotion factors, screening and early detection of hypertensive cases in the communities so as to reduce morbidity and complication due to hypertension.

Previous studies of hypertension morbidity in Thailand are mostly emphasized in health risk behaviors, awareness, treatment, and control in hypertensive patients, who are diagnosed from physicians, or mainly mentioned in clinical treatment in an institute. Only a few studies are concerned for screening hypertension in population who are not having signs of this disease or normal people in societies. However, it is necessary to search or screen hypertension in communities and study in their behaviors related hypertensive condition because, indeed, people age 40 and over are risked to face with hypertensive condition. It is clear that one of the biggest challenges facing public health authorities and medical practitioners is the control of hypertension worldwide, both individual patients and at the population level. To meet this challenge, further research should be conducted by not only screening the hypertensive condition but also recognizing the risk factors and how closely they are related to blood pressure level.

Health survey is also important to provide essential information necessary for screening and planning hypertensive prevention and control programs. In 2004, the Government has come up with the policy of "*Healthy Thailand*," aimed at mobilizing the forces of the nation to build a healthy country, set the strategy for health promotion as a national agenda, as proposed by the Ministry of Public Health to reduce behavioral health risk and major health problems in Thailand (The Ministry of Public Health, 2005). Therefore, this study aimed to measure the prevalence of hypertension and to investigate the health risk behaviors among people aged 40 years and over in communities in Nan Province, Thailand. The result from this study will provide better control and prevention of hypertension.

Methodology and Data analysis

Methodology

This study used the secondary data from the 2004 non-communicable disease screening project in communities in Nan Province conducted by Nan provincial health office. This project aimed to collect data on non-communicable disease, hypertension and diabetes mellitus. Three-stage sampling method was used. Each stage used simple random sampling, and sampling results were 3 districts, 6 sub-districts, and then 60 villages. Data were collected by using questionnaire and blood pressure measurement and conducted by the health officers in 3 districts in which were chosen. Respondents were people aged 40 years and over who were living in the communities. Samples selected in this study were 4,322 persons.

Data analysis

Descriptive statistics were used to describe socio-demographic characteristics, health risk behavior factors, and hypertension morbidity for its frequency distributions and percentages with cross tabulation. Binary logistic regression was used to investigate the associations between demographic characteristics, health risk behavior factors, and hypertension morbidity. Odd ratio was also employed for dichotomous variables to examine the magnitude of associations and whether the associations were positive or negative.

Limitation of the Study

This study used secondary data for analysis, so it was limited by the scope of the questionnaire and details in some items. Hence, it could not be possible to approach some theoretical aspects. Some important dimensions, such as co-morbidity diseases or awareness, treatments, and controls of hypertension, were not captured in the sources of data used.

Findings and Discussions

The study results were presented as followed:

1. Overview of demographic characteristics and health risk factors

The demographic characteristics and health risk factors of the samples aged 40 years and over were shown in Table 1. Over half of the respondents were females. The majority of respondents never detected high blood pressure and high blood sugar, and most of them do not have obese condition. For health risk behaviors, nearly 43 percent never did exercise and nearly one-third was currently smoking and alcohol drinking. In food consumption behaviors which are defined as habitual dietary intake. It is assessed by a food frequency questionnaire that consists of food items in 4 food groups, such as sweet food, salty food, fatty-rich food, and seasoning powder (monosodium glutamate) use, and intake frequency per week. Results were found that more than half of all respondents currently consumed salty, fatty-rich, and sweet food, and used seasoning powder. Approximately, half of them had emotional stress.

Table 1: Percentage distribution of respondents according to demographic characteristics   and health risk factors (n = 4,322)

Variables	Frequency	Percentage
Characteristics		
Sex		
- Male	1,778	41.1
- Female	2,544	58.6
Age group		
- 40 – 59 years	2,854	66.0
- 60 years over	1,468	34.0
	Mean = 55.17; S.D = 11.01	
High blood pressure detection		
- ever	1,347	31.2
- never	2,975	68.8
High blood sugar detection		
- ever	453	10.5
- never	3,869	89.5

Table 1: (Continued)

Variables	Frequency	Percentage
Body mass index		
- ≥ 25 kg/m^2	670	15.5
- < 25 kg/m^2	3,652	84.5
Health risk factors		
Exercise		
- Regular	1,085	25.1
- Sometime	1,382	32.0
- None	1,855	42.9
Smoking		
- Regular	427	9.9
- Sometime	796	18.4
- None	3,099	71.7
Alcohol consumption		
- Regular	207	4.8
- Sometime	1,251	28.9
- None	2,864	66.3
Sweet food consumption		
- Regular	293	6.8
- Sometime	1,626	37.6
- None	2,403	55.6
Salty food consumption		
- Regular	557	12.9
- Sometime	2,239	51.8
- None	1,526	35.3
Seasoning powder use		
- Regular	729	16.9
- Sometime	1,476	34.1
- None	2,117	49.0
Fatty-rich food consumption		
- Regular	340	7.9
- Sometime	3,217	74.4
- None	765	17.7
Stress		
- Regular	589	13.6
- Sometime	1,452	33.6
- None	2,281	52.8

2. Prevalence of hypertension

The overall prevalence of hypertension morbidity defined as the persons who had systolic blood pressure $\geq$ 140 mmHg and diastolic blood pressure $\geq$ 90 mmHg was   18.3 % of the respondents aged 40 years and over as shown in Table 2.

Table 2:   Prevalence of hypertension in Nan Province (n = 4,322)

Blood pressure level	Frequency	Percentage
Hypertension	789	18.3
Normal	3,533	81.7
Total	4,322	100

The prevalence of hypertension morbidity in this study was similar to the finding of National Health Examination Survey (NHES II) in 1996, which was assessed criteria systolic blood pressure $\geq$ 140 mmHg and diastolic blood pressure $\geq$ 90 mmHg in people aged 13 years and over. When compared by age, the findings of this study were 14.8 % and 24.9 % in people aged 40-59 years and $\geq$ 60 years (Table 3) while those of NHES II were 11.6 % and 24.8 % in people aged 13-59 years and $\geq$ 60 years (Thailand Health Research Institute, 1997). Indeed, prevalence of hypertension by age in this study might be equal or lower than NHES II because of different age range between 40-59 years and 13-59 years as the prevalence of hypertension of people aged $\geq$ 60 years in this study was not different from the finding of NHES II.

3. Prevalence of hypertension by demographic and health risk factors

Table 3 showed percentage of incidence of hypertension and demographic and health risk factors. It was found that the increase risks of hypertension were found as the followings.

Prevalence of hypertension in males was higher than females. Hypertensive conditions in aged 60 years and over were higher than those aged 40–59 years. These differences were statistically significant.

Considering the histories of detected high blood pressure and high blood sugar, the prevalence of hypertension of people in community who had ever detected high blood pressure and high blood sugar was more likely than those who had never detected high blood pressure and high blood sugar. These differences were statistically significant.

The prevalence of hypertension in persons who had body mass index ≥ 25 kg/m^2 (obesity) was higher than those of the persons who are not having obesity condition. This difference was statistically significant.

Health risk factors were found that the prevalence of hypertension in people who lack of exercise was higher than those of people who have regularly exercised. However, this difference was not statistically significant.

The prevalence of hypertension among people who were regularly smoking and consuming alcohol was higher than those of people who were not smoking and consuming alcohol. The difference of smoking was not statistically significant while the difference of alcohol consumption was statistically significant.

Considering food consumption behaviors, it was found that the prevalence of hypertension in people who were regularly consuming salty, fatty-rich food, and using seasoning powder was higher than those of people who were not consuming salty, fatty-rich food, and using seasoning powder. These differences were statistically significant.

Finally, people who were regularly stresses had the prevalence of hypertension higher than people who were not stress. This difference was statistically significant.

Table 3:   Prevalence of hypertension by demographic and health risk factors

Variable	Total	Hypertension n	Hypertension %	Normal n	Normal %	P-value
Gender						
Female	2,544	418	16.4	2,126	83.0	<0.001
Male	1,778	371	20.9	1,407	79.1	
Age (years)						
40 – 59 years	2,854	423	14.8	2,431	85.2	<0.001
60 years and over	1,468	366	24.9	1,102	75.1	
Ever detected high blood pressure						
Ever	1,347	371	27.5	976	72.5	<0.001
Never	2,975	418	14.1	2,557	85.9	
Ever detected high blood sugar						
Ever	453	169	37.3	284	62.7	<0.001
Never	3,869	620	16.0	3,249	84.0	
Body Mass Index						
≥ 25 kg/m^2	670	142	21.2	528	78.8	0.032
< 25 kg/m^2	3,652	647	17.7	3,005	82.3	
Exercise						
Regular	1,085	198	18.2	887	81.8	0.472
Sometime	1,382	239	17.3	1,143	82.7	
None	1,855	352	19.0	1,503	81.0	
Smoking						
Regular	427	93	21.8	334	78.2	0.105
Sometime	796	135	17.0	661	83.0	
None	3,099	561	19.0	2,538	81.9	
Alcohol consumption						
Regular	207	60	29.0	147	71.0	<0.001
Sometime	1,251	213	17.0	1,038	83.0	
None	2,864	516	18.0	2,348	82.0	
Sweet food intake						
Regular	293	50	17.1	243	82.9	0.839
Sometime	1,626	301	18.5	1,325	81.5	
None	2,403	438	18.2	1,965	81.8	
Salty food intake						
Regular	557	127	22.8	430	77.2	0.002
Sometime	2,239	416	18.6	1,823	81.4	
None	1,526	246	16.1	1,280	83.9	
Fatty-rich food intake						
Regular	340	94	27.6	246	72.4	<0.001
Sometime	3,217	543	16.9	2,674	83.1	
None	765	152	19.9	613	80.1	

Table 3: (Continued)

Variable	Total	Blood pressure level				P-value
		Hypertension		Normal		
		n	%	n	%	
Seasoning powder use						
Regular	729	170	23.3	559	76.7	<0.001
Sometime	1,476	247	16.7	1,229	83.3	
None	2,117	372	17.6	1,745	82.4	
Stress						
Regular	589	163	27.7	426	72.3	<0.001
Sometime	1,452	255	17.6	1,197	82.4	
None	2,281	371	16.3	1,910	83.7	

4. Factors related to hypertension

The multivariate analysis was applied with binary logistic regression. Nine out of thirteen variables showed a statistically significant related to hypertension. The increased risks of hypertensive conditions were found to be associated with age, body mass index, persons who were ever detected high blood pressure and high blood sugar, alcohol consumption, salty and fatty-rich food intake, seasoning powder use, and stress (Table 4).

There was a statistically significant association between age and hypertension morbidity (Odd Ratio 1.04, $p < 0.001$). When ages were higher, the chance of hypertension increased by 4 percent. So, older persons have higher risk of hypertension than younger persons. Similar to the national health survey, it was found that the highest rate was reported at age $60 - 64$ years (Chooprapavan, 2000). The reason might be that changes in body structure and function occur with age. Age-related rise of blood pressure is neither an inevitable nor normal biological accompaniment of the age process (Smiciklas, 1990). Age is one risk factor that can't be changed. Generally speaking, hypertension is more common in middle age and the elderly, but children can also have elevated blood pressure. Generally, the older people get, the more likely they are to develop high blood pressure.

People ever detected with high blood pressure had 2.1 times more likely to develop hypertension morbidity than those never detected in high blood pressure

(Odd Ratio 2.1, p < 0.001). One possible explanation might be that most uncomplicated hypertension is asymptomatic. Persons may not be aware to follow up blood pressure for disease prevention because it does not cause symptoms and they can have it even though they feel fine. Unaware cases may be affected for 10 – 20 years (Chooprapavan, 2000). For instance, it is estimated that one in four adults (approximately 50 million) in the United States has elevated blood pressure – and more than 30 percent of them are unaware of it. Since people with hypertension may not exhibit any symptoms, their high blood pressure is often undiagnosed until complications occur. Regular blood pressure screening can facilitate early diagnosis and treatment and reduce the risk of further complications associated with hypertension (Connell, 2005).

Similar to blood pressure, persons ever detected high blood sugar had 2.7 times more likely to develop hypertension morbidity than those never detected high blood sugar (Odd Ratio 2.7, p < 0.001). One possible explanation might be that respondents used to find high blood sugar had tended to develop to diabetes mellitus. Corresponding, the study of Morgencen (2005) found that the prevalence of hypertension is 2 to 4 times greater in patients with diabetes mellitus compared with matched non-diabetes individual.

Persons having over weight with body mass index (BMI) $\geq$ 25 kg/m^2 had 1.4 times higher risk of hypertension morbidity than those who had body mass index < 25 kg/m^2 (Odd Ratio 1.4, p < 0.01). It is possible that higher BMI generally indicates higher serum cholesterol and triglyceride level which are related to high blood pressure. Obesity is associated with several co-morbidities that shorten life expectancy, in particular type 2 diabetes mellitus, arterial hypertension, and hyperlipidemia (Potiroli, 2004). This finding corresponded to the studies of Percy et al. (1997), Quasem et al. (2001) and Jo et al. (2001) who found the positively associated between over body mass index and hypertension.

There was a significant positive association between alcohol consumption and hypertension morbidity. Drinkers who regularly drank had 1.6 times higher risk of hypertensive condition than non-drinkers (Odd Ratio 1.6, p < 0.01). This result corresponds with other studies, but risks estimated for hypertension were different. Nakanishi et al. (2001) in a longitudinal study showed that after controlling for potential predictors of hypertension, the relative risks for hypertension compared with non-

drinkers were 1.52, 1.81, 2.12, and 2.48 times for persons who drank 0.1-22.9, 23-45.9, 46-68.9, and > 68.9 gram/day of ethanol, respectively. Funchs et al. (2001) in a cohort study found that there was an increased risk of hypertension in those who consumed large amounts of ethanol (> 210 gram/week) compared with those who did not consumed alcohol over the 6 years of follow-up. In Thailand, most of Thai people prefer to drink alcohol beverage. The National Health Survey in Thailand showed prevalence of alcohol consumption in population aged 13-59 years was 33.04 % and 33.67 % in 1993 and 1998, respectively (Chooprapavan, 2000). Similarly, Pati (2004) in a hospital-based case-control study at Pua Hospital in Nan Province by controlling conventional confounders showed that the relative risks for essential hypertension compared with non-drinkers were 2.27, 2.23, 2.47, 3.38, and 8.87 times for persons who were current drinkers, duration of alcohol drinking of 11-20 years, drinkers with duration of more than 20 years, drinkers who drank 3-4 days/week, and drinkers who drank more than 281 gram/week, respectively. These data suggested that alcohol consumption is a potentially important risk factor for increasing blood pressure.

In food consumption behaviors, there were significant positively associated between frequencies of salty food intake, seasoning powder use and hypertension morbidity. People who regularly consumed had 1.4 times and 1.8 times higher risk of hypertension than non-consumption (Odd Ratio 1.4 and 1.8, p < 0.05 and 0.01, respectively). The reason might be that both salt and seasoning powders have sodium which is the important component. Sodium, in the form of sodium chloride or table salt, is linked to levels of blood pressure. The role of sodium as apposed to salt intake is less disputed. Previous studies have shown that hypertension and their relatives have deficits in cell membrane sodium transport leading to high intracellular calcium and heightened vascular reactivity to vasoconstrictive agents (Appel et al., 2003; Beckmann, 1995). Individual response of blood pressure to variation in sodium intake differs widely; as groups, African Americans, older people, and patients with hypertension or diabetes are more sensitive to changes in dietary sodium chloride than are others in the general population. Epidemiologic data demonstrate a positive association between sodium intake and level of blood pressure (Weinberger, 1996).

Similarly, there was statistically significant association between frequencies of fatty-rich food intake and hypertension morbidity. Persons who regularly consumed had 1.5 times higher risk of hypertension than non-consumers (Odd Ratio 1.5, p < 0.01). This study found that respondents regularly and sometime preferred to consume fatty food   7.9 % and 74.4 %, respectively. One possible explanation might be that most of rural people like to use saturated oil for cooking and prefer to eat meat such as pork, fatty diet, which led to cause of high cholesterol. Previous studies have shown the positive association between high cholesterol as a risk factor of hypertension and coronary heart disease (Law, 1994).

Finally, persons who have regular emotional stress had 1.9 times higher risk of hypertension morbidity than persons who have none (Odd Ratio 1.9, p < 0.001). This finding can be explained by socio-economic changes that have contributed to an improvement in health. On the other hand, they resulted in psychological stress that could affect people's health conditions. Recent evidence confirms the association between stress and hypertensive conditions. Medical doctors involved in the Framingham Heart Study have confirmed that a high level of anxiety can indeed cause future hypertension (Markovitz, 1993). Problems, related to mental health, are not only the kind of problems that affect only any particular individual who has them, but they also have an impact on the surrounding people and the society at large. Similarly, this study found that respondents had 13.6 % and 46.6 % regular and sometime emotional stress, respectively. These showed that mental health is inter-related and linked with innumerable factors, including economic, political, educational, environmental, demographic, and personal factors.

Table 4: Odd Ratio from logistic regression analysis for hypertension

Variables	β	SE	Odds Ratio
Gender			
Male	0.067	0.091	1.069
Female[®]			
Age (years)	0.037[***]	0.004	1.037
Ever detected high blood pressure			
Ever	0.755[***]	0.088	2.128
Never[®]			
Ever detected high blood sugar			
Ever	0.993[***]	0.115	2.699
Never[®]			
Body Mass Index			
≥ 25 kg/m^2	0.339[**]	0.114	1.403
< 25[®] kg/m^2			
Exercise			
Regular	0.008	0.108	0.938
Sometime	-0.001	0.101	0.999
None[®]			
Smoking			
Regular	0.146	0.137	1.158
Sometime	0.095	0.119	1.100
None[®]			
Alcohol consumption			
Regular	0.480[**]	0.183	1.616
Sometime	0.096	0.106	1.101
None[®]			
Sweet food consumption			
Regular	-0.285	0.178	0.752
Sometime	-0.097	0.091	0.908
None[®]			
Salty food consumption			
Regular	0.327[*]	0.137	1.387
Sometime	0.164	0.103	1.178
None[®]			
Fatty-rich food consumption			
Regular	0.435[**]	0.168	1.546
Sometime	-0.069	0.119	0.934
None[®]			

Table 4: (Continued)

Variables	β	SE	Odds Ratio
Seasoning powder use			
Regular	0.590***	0.122	1.804
Sometime	0.074	0.101	1.077
None[®]			
Stress			
Regular	0.620***	0.118	1.858
Sometime	0.182	0.100	1.200
None[®]			
R square		0.133	
-2 Log likelihood		3739.2	
df		21	

® = Reference group   * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Conclusion

The results of this study revealed that the prevalence of hypertension morbidity of community people aged 40 years and over in Nan Province was 18.3 % over all, found more in males (20.9 %) than females (16.4 %) and in age over 60 years (24.9 %) than   40 – 59 years (14.8 %). Using binary logistic regression, it was found that factors related to hypertension morbidity were both demographic characteristics and health risk factors. Age and body mass index (BMI) had significant positive influence on hypertension, and had 1.03 times and 1.4 times higher risk of hypertension than those who were younger and non-obesity. Persons, ever detected high blood pressure and high blood sugar, had significant positive association with hypertension, and had 2.1 times and 2.7 times more likely to develop to hypertensive morbidity than those who were never detected. In addition, health risk behavior factors including sodium intake both salty and seasoning powder food, fatty-rich food consumption, alcohol consumption, and emotional stress had significant positive influence on hypertension. Persons who regularly practice health risk behaviors had 1.4, 1.8, 1.5, 1.6, and 1.9 times higher risk to develop to hypertensive morbidity than those who did not.

From these findings, there are various factors that put people at risks for hypertension morbidity. Increasing age and gender are factors that cannot be controlled. Whereas risk factors of health behaviors in lifestyle leading to hypertensive condition, such as obesity, dietary intake, stress, and excessive alcohol consumption, can be controlled. The important points are how to promote, educate, and empower people to aware and adopt disease prevention because these methods are major health promotion initiatives.

Recommendations

Based on the findings of this study, the following issues should be considered and promoted for improving the prevention of hypertensive condition in community people.

1. The findings indicate that prevalence of hypertension is still highly detected in the communities, especially in males and older persons. It is necessary that policy maker and healthcare provider should continuously conduct periodically survey for screening and early detection, treatment, and control for hypertensive case in communities. Since people with hypertension may not exhibit any symptoms, their high blood pressure is often undiagnosed until complications occur. Regular blood pressure screening can facilitate early diagnosis and treatment and reduce the risk of further complications associated with hypertension. In a primary care practice or other health care providers in communities, such as Primary Care Unit (PCU), Community Healthcare Service, and Community Hospital, in which people have usually utilized, the health care providers can have a positive impact on prevention and management of hypertension through patient education and counseling because the community practitioners are often the first provider seen when a new patient comes to the provider. So, the community practitioners should perform the initial evaluation and set up a care plan that includes primary and secondary prevention strategies.

2. The findings signify that persons, ever detected high blood pressure and high blood sugar but no awareness to follow-up, were 31.2 % and 10.5 %, respectively,

and they had 2.1 times and 2.7 times more likely to develop to hypertension morbidity than those who never detected these symptoms. These groups are important to emphasize for investigation in hypertensive conditions and other related diseases because hypertension is a very common cardiovascular problem, causing an enormous economic burden to the community and the government. Therefore, people ever detected high blood pressure more than 140/90 mmHg or high blood sugar should be assessed and followed closely. Moreover, it would be very interesting to do research in future on the characteristics of people who do and do not get tested of blood pressure. Research on testing would be very useful for public health care programs.

3.   The basic principle is that disease with common risk factors requires common preventive strategies. The preventive strategies should be based on a health education and empowerment programs that promote and advocate healthy lifestyles, by improvement of dietary habits, eradication of alcohol consumption, increased physical activity and alleviation of deleterious psychosocial factors related to hypertension. Lifestyle modifications offer the potential for preventing hypertension, have been shown to be effective in lowering blood pressure, and can reduce other cardiovascular risk factors at little cost and with minimal risk. To be successful in reducing hypertension in communities, people should understand what high blood pressure is and the effects of untreated high blood pressure on overall health and well-being. It is also important to demonstrate the relationship that high blood pressure has with the development of other diseases. Providing simple explanation through one-on-one or group discussion with examples is important for awareness in disease prevention, and defines the values that constitute hypertension.

4.   Hypertensive prevention programs should focus on eating habits to sodium use reduction, especially seasoning powders used, because most people in rural communities preferred to use them for making the delicious food, and most of food shops usually put the seasoning powder in several foods with the same reason. Thus, in the lifestyle of food consumption, people in communities not only take sodium in the households but also consume its outside. For the prevention of hypertensive conditions by food consumption, health education and nutritional program of sodium restriction on healthy food should be correctly provided.

5.　The other findings reveal that subjects exposed to the various risk factors, such as current alcohol consumption (33.7 %), stress (47.2 %), and obesity BMI $\geq$ 25 kg/m^2 (15.5 %). Therefore, campaigns for health promotion in order to modify lifestyle about alcohol consumption should inform about the knowledge and health care to avoid these risk factors. Overweight and obese persons should be educated and motivated regarding proper dietary and physical exercise for controlling body weight because an association with hypertension was found in the study. Weight reduction has been shown in many studies to reduce blood pressure. Recent studies also demonstrate a relationship between the weight loss, decrease in blood pressure and insulin sensitivity (Reaven, 2003), and have also demonstrated that a nutritional program of weight loss, tobacco and alcohol restriction achieved a 39 % success rate in reducing blood pressure without drugs (Stamler, 1987 cited in Ellie, 2005).

Acknowledgement

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