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Introduction

The first blood pressure (BP) measurement was done in Teddington in 1733 by a priest named Stephen Hales. He had earlier studied how the trees could push the sap from the root to the branches with the use of pressure. Stephen thought that perhaps humans and animals had the same mechanism to force the blood forward in the blood vessels. By testing his hypothesis, he measured the BP of a horse. Stephen made a cut on the carotid artery and inserted a cannula. A long glass tube was added to the cannula and the priest then let the blood rise freely. The blood rose to a height of 2720 millimetre (mm). He divided the height with the weight of mercury and found that the horse had a BP of 200-millimetre mercury (mmHg). This is why blood pressure is still to this day measured in mmHg (Pernow, 2002). Today, blood pressure is a known concept and is a good measurement for grading people's health. It is an important tool in prevention of hypertension and cardio vascular diseases (CVD). Therefore it is important with repeated blood pressure screenings on patients to be able to catch a potential rise of the BP (Mishra et al., 2013).

Background

The force of the blood that flows through the blood vessels is called BP. The BP is composed by three components: cardiac output, vascular resistance and blood volume (Mayet & Hughes, 2003). A normal BP is between 90 mmHg and 120 mmHg in systolic blood pressure (SBP) and 60 mmHg to 79 mmHg in diastolic blood pressure (DBP). BP higher than 140/90 mmHg is called hypertension. A BP between 120/80 mmHg and 139/89 mmHg is called prehypertension (American Heart Association, 2016; Peltzer et al., 2017). Hypertension is a leading risk factor for mortality worldwide because it could cause CVD and kidney disease (Kahan, 2014). A person can develop prehypertension or hypertension early on in life, some as early as in puberty and the prevalence of prehypertension increase with age (Al-Majed & Sadek, 2012).

Prehypertension

Prehypertension was defined in 2003 by The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 7). JNC 7 defined the new category to identify individuals that have a higher risk of developing diseases associated with hypertension compared to normotensives but had not yet developed hypertension. Research shows that individuals who are prehypertensive are more likely to develop hypertension over time. They also have a higher risk of developing CVD (Habib et al., 2015). There is an excess risk of developing CVD and stroke when the BP is low range prehypertensive, between 120 to 129 mmHg in SBP and 80 to 84 in DBP mmHg and is further increased when it reaches 130 to 139 mmHg in SBP and 85 to 89 mmHg in DBP (Huang et al., 2015). An individual with a BP of 135/80 mmHg has twice as high risk to die from a stroke compared to as an individual with a BP of 115/80 mmHg (Habib et al., 2015; Debberma et al., 2015). Even with the known risk factors that appear with prehypertension it is not classified as a medical condition and therefor it does not require medical treatment. The JNC 7 does however recommend a comprehensive therapeutic lifestyle modification strategy for individuals with prehypertension. The strategy's aim is to reduce the risk of developing hypertension (Habib et al., 2015).

Hypertension

Hypertension is a health problem worldwide and is related to mortality if no treatment is provided (Hür et al., 2014). Hypertension can affect the DBP, SBP or both pressures. The SBP increases with a rising age, while the DBP levels of at around 50 years of age. A rise in SBP is

a big risk factor to develop CVD later in life (Chobanian et al., 2003). Classification of hypertension is divided into primary or secondary hypertension. Primary hypertension is mostly caused by lifestyle or genetic factors and often occur in middle- to old age. Secondary hypertension is caused by another medical condition such as endocrine or renal disorder and often occur in an earlier age (Poulter et al., 2015). Hypertension puts a strain on the vessel wall, and this state can lead to a damage in the endothelial. Atherosclerosis is a medical condition where fat is stored in the vessel wall of the arteries and this can develop into calcinosis of the vessel wall (Bevegård, 2002). When the endothelial cells are damaged plaque will develop in the vessel wall. The development of plaque caused by hypertension is most common in the coronary arteries, carotid artery and the arteries of the brain. The atherosclerosis is a risk factor for developing stroke or ischemic heart disease (Ericson & Ericson, 2012). If an early diagnosis and treatment are provided for hypertension, the risk of developing CVD can be reduced (Hür et al., 2014).

Risk factors

As much as 95 % of hypertension cannot be explained by sociodemographic characteristics and is referred to as essential risk factors. Essential risk factors are variables that a person can change to reduce the risk of hypertension (Collier & Landram, 2012). There are a broad variety of risk factors which can lead to development of hypertension. These factors can be divided into different subcategories. The categories are sociodemographic characteristics, nutritional facts and lifestyle habits (Peltzer et al., 2017). Sociodemographic characteristics refers to an individual's place in the population and is an internal risk factor, meaning that it cannot be changed (Collier & Landram, 2012). This includes gender, age, occupation and education level. Older age is a big risk factor for developing hypertension (Everett & Zajacova, 2015). Another risk factor is genetics, a person with a family history of hypertension is about four times more likely to develop hypertension than a person without heredity. Researchers have identified 12 genes that can affect the BP. These genes affect the components cardiac output or the vascular resistance which leads to an increase in the BP pressure (Ehret & Caulfield, 2013). Gender is a huge sociodemographic risk factor where males are over represented. Males are especially over represented in the young adults' age group. In the age group 18-29 years, around 5 % of the male population had hypertension while it was 1.5 % of females of the same age. This is believed to be because of biological factors. Researchers believe that the higher prevalence of hypertension is partly caused by chromosomal differences between the genders. The female sex hormone estrogen is believed to have a protective effect against hypertension. When females

reach menopause their levels of estrogen goes down and the difference in hypertension prevalence is reduced between the genders (Everett & Zajacova, 2015). After the age of 60, females outpace men and have a higher incidence of hypertension (Collier & Landram, 2012).

Nutritional fact refers to an individual's eating habits. A food high in cholesterol leads to higher levels of cholesterol in the blood. This condition is called hypercholesterolemia. Hypercholesterolemia increase the risk of hypertension. Treating both the hypercholesterolemia and the hypertension reduces the risk of CVD with 35 % compared to 25 % if only the high BP is treated (Egan et al., 2013; Sakura et al., 2011). Eating food with high levels of sodium can lead to an increase in the BP. The cardiac output and vascular resistance is increased when the levels of sodium in the blood rises. When the sodium reaches the kidneys, the organ creates a bigger extracellular volume. This leads to a higher cardiac output which cause an increase in vascular resistance. A person who eats a diet without an adequate amount of fruit and vegetables will have a higher risk of develop hypertension (Collier & Landram, 2012).

Many lifestyle habits can affect the BP in a negative way. Substance abuse, including drugs, alcohol and tobacco causes a rise in the BP (Peltzer et al., 2017). Lack of physical activity could lead to weight gain and obesity. American Heart Association recommend an adult to exercise for at least 30 minutes, five times a week to prevent heart disease (American Heart Association, 2017). Obesity comes with a higher body mass index (BMI) and is one of the biggest risk factors for developing hypertension. Obesity changes the hormonal balance in the body, together with changes in the endothelia and a rise in inflammation in the body, it could lead to hypertension (Seravalle & Grassi, 2017). A high level of satisfaction with life is a good protection against hypertension. People who are unsatisfied with their life, feeling stressed or are suffering from depression have a higher incidence of hypertension than their satisfied counterparts (Peltzer et al., 2017). A short sleep duration, shorter than six hours per night, causes a rise in the prevalence of hypertension from 15 % to 20.3 % (Guo et al, 2011; Fernendez-Medoza et al., 2012).

Sources of error

To acquire correct readings when measuring the BP, sources of error needs to be controlled (Frese et al., 2011). One common source of high BP is the white coat effect. This means that the BP is raised when a health care worker is performing the measurement but the BP is normal while measured with ambulatory blood pressure monitoring (Frese et al., 2011; Franklin et al., 2013). To determine the correct values of the BP reading, the quality of the equipment needs to

be inspected. To accomplish correct values, a calibration of the equipment should be done on a regular basis (Mishra et al., 2013). To acquire a reliable measurement value, right placement and a correct bladder cuff size must be used (Frese et al., 2011). It is important to use a bladder cuff size that is suitable for the arm. By using a too small bladder cuff, the BP reading could be increased. A bladder cuff which is too big could lead to a reduction in the BP reading (Mishra et al., 2013). The examiner's experience in BP measurement is another source of error. Patient related sources of error which could affect the variability of the BP measurement, are stiff arteries and arrhythmias. These two factors are more common among older individuals. Other sources that can affect the blood pressure reading are anxiety, time of day and background noise. Intake of caffeine, nicotine, alcohol or food before the measurement can affect the BP. Talking or crossing legs during the measurement can increased the BP. If physical activity is done within 30 minutes before the measurement this could affect the BP reading (Frese et al., 2011). It is important to let the patient sit and wait for about 10 minutes before measuring the BP, because after this period of time the pressure reading is the most representative of the true BP (Nikolic et al., 2014).

Blood pressure in Vietnam

Vietnam has a population of around 95 million, which makes it the 15th most populated country in the world (Worldometers, 2018). About one third of the male and one fourth of the female population over 25 years of age has hypertension. Diseases caused by hypertension has become one of the leading causes of death in Vietnam, which has made it a public health problem. The hypertension in Vietnam is rapidly increasing but the awareness and treatment of hypertension is low. Only about half of the affected knows about the condition and only one third have taken precaution to keep it under control (Ha et al., 2014). According to an earlier study done on students living in countries which are members in Association of Southeast Asian Nations (ASEAN) the prevalence of prehypertension and hypertension were around 25 %. Vietnam was one of the participating countries. The study found that among 793 students, 15.9 % had prehypertension and another 4.8 % were hypertensive (Peltzer et al., 2017).

Aim

The aim of this study is to evaluate the prevalence of prehypertension and hypertension in young adult medical students in Vietnam and investigate which known risk factors the population is most often exposed to.

Research methodology

Design

This study is quantitative with a study group consisting of 30 medical students at Da Nang University of Medical Technology and Pharmacy in Vietnam. The blood pressure of the study group was measured three times in one day, in the morning, noon and afternoon to monitor the variation throughout the day. Classification of the BP was divided into normotensive, prehypertension and hypertension according to the JNC-7 classification. Normotensive is an SBP of $\leq$ 119 mmHg and DBP of $\leq$ 79 mmHg, prehypertension is a SBP of 120-139 mmHg and DBP of 80-89 mmHg and hypertension is a SBP of $\geq$ 140 mmHg and DBP of $\geq$ 90 mmHg. To enable calculations of descriptive statistics in SPSS, the BP classes were coded as numbers. The participant's mean SBP and DBP were calculated to be able to classify each individual in a BP group according to the SBP. The University provided the examiners with a random selection of students with an equal distribution between the genders. Excluding criteria for the study were medical treatment for hypertension or other medication which could affect the blood pressure and Cimino fistula (AV-fistula) in the left arm. The students' participation was on a voluntary basis and a consent letter containing information about the study was handed out. The consent letter was translated into Vietnamese, to make sure all participants were fully aware of the study's purpose and the rights of the participants. The consent letter was signed before the students were able to join the study. In addition to the consent letter the participants were asked to fill out a lifestyle questionnaire with questions regarding gender, age, stress level, smoking-, alcohol-, food-, caffeine- and sleep habits. This was done in an attempt to correlate the blood pressure readings with known risk factors of hypertension. The consent letter in English is attached as appendix 1 and the translated version is attached as appendix 2. The questionnaire in English is attached as appendix 3 and the translated version is attached as appendix 4. The participants were assigned a number at the beginning of data collection to ensure confidentiality for the participants. During the day of the data collection and data analysis the participants were only identified by their assigned number to prevent identification. The assigned number was written on the questionnaire to simplify the association between the participant and the collected material when analysing the data.

Equipment

In the study, an Omron M7 IntelliSense (Omron Healthcare Europe B.V., Netherlands) digital automatic blood pressure monitor was used. By measure the pressure variations caused by pulse

waves both on the inflation and deflation of the cuff, the monitor is able to read the blood pressure. The display of the monitor visualizes the SBP and DBP reading as well as the heart rate when the measure is completed. The cuff of the BP monitor allows an arm range of between 22 and 42 centimeters (Omron healthcare, n.d). To guarantee the reliability of the monitor, the examiners conducted repeated measurements on the same person to make sure that the machine was calibrated. Figure 1 displays the automatic BP monitor that was used during the data collection.

Figure 1. Image of the Omron M7 IntelliSense digital automatic blood pressure monitor.
April 29, 2018.

Data collection

The data was collected over two days with 15 participants each day. The blood pressure was measured on the study group three times in one day, 7:00 ante meridiem (am), 12:00 post meridiem (pm) and 5:00 pm. During the first appointment the participants filled out the questionnaire while resting for 10 minutes. During the following appointments the participants were asked to sit down and rest for 10 minutes prior to having their blood pressure measured. The blood pressure was then taken in a horizontal position to secure that the measurement is as accurate as possible. The cuff was placed on the left upper arm, 1-2 cm above the fossa cubitalis. In figure 2 the placement of the cuff can be visualised. One examiner performed the BP measurement and the other examiner registered the measurement in an Excel document. The

collected data was later transferred into Statistic Package for the Social Science (SPSS) together with the answers from the questionnaire.

Figure 2. Demonstration of the cuff placements on the left upper arm. April 29, 2018.

Data analysis

The collected data was processed in the analytic program IBM Statistic Package for the Social Science (SPSS) Statistics version 25, (IBM Corporations, Armonk New York, USA). Descriptive statistics were performed in SPSS using crosstabs. A mean BP of each participants was calculated from the three measurements taken and the SBP was used to divide the population into the different BP categorize. Values calculated from the crosstabs were transferred into tables and figures. The figures were created in Microsoft Word 2016 version 16.12, (Microsoft Corporation, Santa Rosa, California, USA). Tables in the study were created in Microsoft Excel 2016 version 16.12, (Microsoft Corporation, Santa Rosa, California, USA).

Ethical considerations

The aim for minor field studies (MFS) scholarship holders are to develop more knowledge around developing countries and questions regarding development issues (SIDA, n.d). The scholarship holder should work towards the sustainable development goals set by the United Nations (UN) in Agenda 2030 during the field study. Goal number three is to ensure healthy lives and promote well-being for all at all ages. Reducing premature deaths caused by non-communicable diseases by one third is one of the sub targets (Sustainable development UN, 2015). One of these diseases is hypertension. The examiners worked after the principle of doing good which means that the health care worker always should try to improve health and wellbeing (Kjellström, 2012). With this study, knowledge about hypertension among the

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younger population could be raised and the health of the participants of the study could be improved. While writing the thesis and collecting the data the examiners were following the *Ethical considerations for student thesis* (Jönköping University, 2017). This means all participants received the information needed to fully understand the reason and aim of the study and that it was on a voluntary basis. The participants signed a consent letter before the start of the participation and were informed about the option of dropping out of the study at any time without any further explanation. To the examiners understanding the participants took part of the study on a voluntary basis and the participants had signed the consent letter before the start of the data collection. The examiners perceived the teacher as an authoritarian person in relation to the students. This might have made the students feel forced to participate in the study. Due to the authoritarianism by the teacher, full voluntary participation cannot be guaranteed. In this study no experiment or procedure were implemented that might have violated the participants integrity. Therefore, the examiners opinion is that it is ethically defendable. The collected data were obliterated to prevent leakage of sensitive information about the participants. The participants which were found to have hypertension were informed by the supervisor in hindsight and were encouraged to seek out a medical professional.

Results

The study consisted of 30 participants, 15 females and 15 males. The participants were between 19 and 22 years old with a mean age of 20.23 years. The distribution of mean SBP for each participant is presented in figure 3. Mean SBP for the whole population was 119.21 mmHg with a standard deviation of 12.97. BP distribution among the participants; 53 % normotensive, 40 % prehypertension and 7 % hypertension which is demonstrated in Figure 4. BP distribution among the females; 60 % normotensive, 33 % prehypertension and 7 % hypertension (Figure 5). BP distribution among the males; 46 % normotensive, 47 % prehypertension and 7 % hypertension (Figure 6).
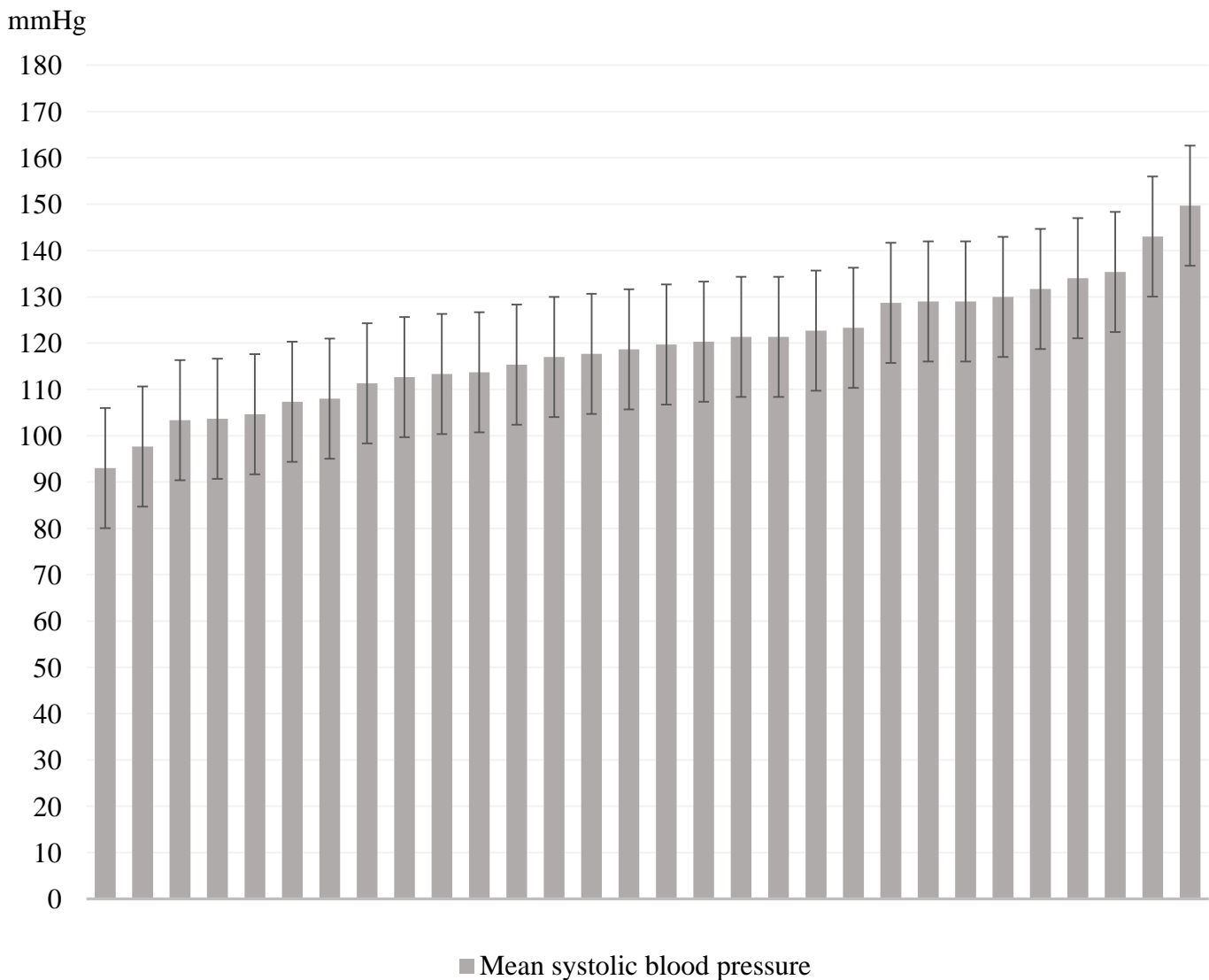
Figure 3. Distribution of mean systolic blood pressure of each participant with the standard deviation.

Blood pressure distribution among the students

7%

40%

53%

■ Normotensive　■ Prehypertension　■ Hypertension

Figure 4. Percental distribution of blood pressure classes among the students

Blood pressure distribution among females

7%

33%

60%

■ Normptensive　■ Prehypertensive　■ Hypertension

Figure 5. Percental distribution of blood pressure classes among women

Blood pressure distribution among males

7%

47%

46%

■ Normotensive　■ Prehypertension　■ Hypertension

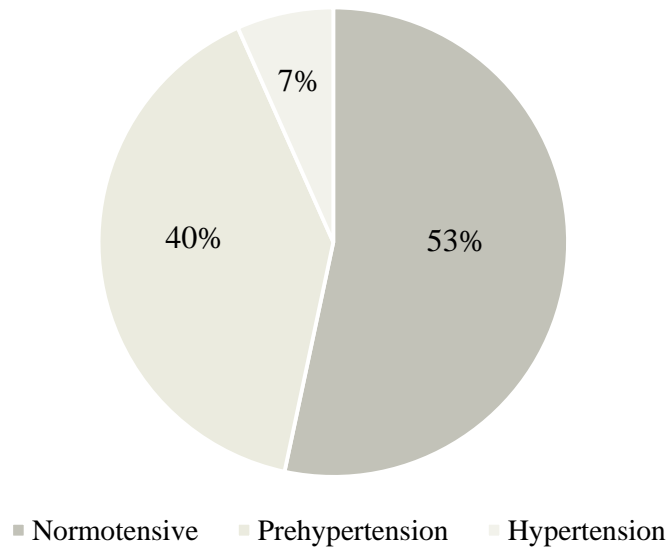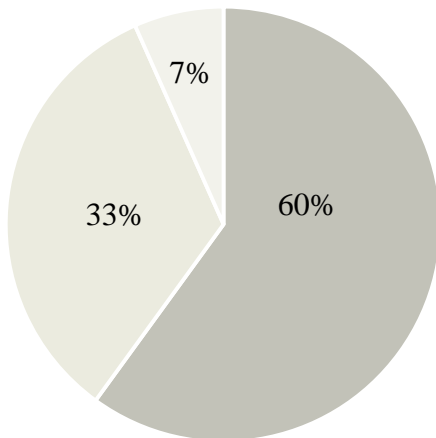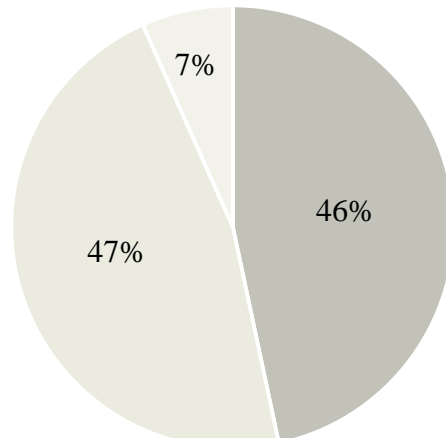**Figure 6.** Percental distribution of blood pressure classes among males

The population's SBP is classified into normotensive, prehypertension and hypertension according to sociodemographic risk factors. Among the females, 5 participants had prehypertension and 1 hypertension, 7 male participants had prehypertension and 1 had hypertension. The participants were all of similar age, between 19 – 22 years old. From the questionnaire the question regarding heredity were asked as a yes or no question. The participants were asked if anyone in their family had hypertension. The sociodemographic variables for risk factors associated to hypertension according to the BP classification are presented in table 1.

Table 1. Sociodemographic variables according to BP classification ($N = 30$)

Sociodemographic	Normotensive	Prehypertension	Hypertension	Total
Gender				
Female	9	5	1	15
Male	7	7	1	15
Heredity for hypertension[1]				
Yes	7	5	1	13
No	9	7	1	17

[1] Refers to known hypertension among siblings, parents or grandparents

Among 30 participants, 2 were overweight, 1 was classed as prehypertensive and 1 hypertensive. Of the 19 participants who exercised for less than five times a week, were 8 prehypertensive and 2 were hypertensive. Participants with hypertension drank at least 2 cups of caffeine each day, slept for minimum 7 hours each night and felt satisfied in life satisfaction. In the prehypertensive population, 7 participants drank at least 2 cups of caffeine each day, 9 participants slept for 4-9 hours per night, 6 participants answered okay and 6 participants answered satisfied in the life satisfaction. None of the participants smoked and 5 participants drank alcohol out of which 1 were prehypertensive. The question about alcohol consumption was asked to the participants with a yes or no answer option. Participants that answered yes were asked a follow-up question regarding the amount of alcohol consumption per week. No one of the participants who answered yes drank more than two glasses per week. Solely one participant had a known hypertension and no one of the participants had any medication that could affect the BP. Among the participants who felt stressed 5 were prehypertensive and 1 hypertensive. The question regarding the study participants stress levels were designed as a yes or no question. The lifestyle variables according to the BP classes are presented in table 2.

Table 2. Lifestyle variables according to BP classification ($N = 30$)

Lifestyle	Normotensive	Prehypertension	Hypertension	Total
Body Mass Index (BMI)				
Underweight (≤18,5)	4	2	0	6
Normal weight (18,5-24,9)	12	9	1	22
Overweight (≥25)	0	1	1	2
Exercise (times per week)[1]				
0	4	0	0	4
1-2	4	5	2	11
3-4	1	3	0	4
5-6	3	3	0	6
≥7	4	1	0	5
Caffeine (cups per day)				
0	10	4	0	14
≤1	2	1	0	3
≥2	4	7	2	13
Alcohol				
Yes	4	1	0	5
No	12	11	2	25
Smoking				
Yes	0	0	0	0
No	16	12	2	30
Stress[2]				
Yes	10	5	1	16
No	6	7	1	14
Sleep duration (hours per night)				
4-6	10	9	0	19
≥7	6	3	2	11
Life satisfaction				
Very dissatisfied	0	0	0	0
Dissatisfied	1	0	0	1
OK	7	6	0	13
Satisfied	8	6	2	16
Very satisfied	0	0	0	0
Known hypertension				
Yes	0	0	1	1
No	16	12	1	29
Medication for hypertension				
Yes	0	0	0	0
No	16	12	2	30

[1]Exercise for more than 30 minutes

[2]The question regarding the study participants stress levels were designed as a yes or no question

Among the participants who added salt to the food, 10 were prehypertensive and 2 were hypertensive. Out of the 26 participants who eat a fruit and vegetable-based diet, 11 had prehypertension and 2 hypertension. Nutritional risk factors according to BP classes are presented in table 3.

Table 3. Nutrition variables according to BP classification ($N = 30$)

Nutrition variables	Normotensive	Prehypertension	Hypertension	Total
Salt added to food[1]				
Yes	15	10	2	27
No	1	2	0	3
Fruit and vegetable				
Yes	13	11	2	26
No	3	1	0	4

[1]For example fish sauce, pepper salt, chili salt

Discussion

This study was performed in Da Nang, Vietnam because of a collaboration between *Jönköping University, School of Health and Welfare* and *Da Nang University of Medical Technology and Pharmacy*. The aim of this study was to evaluate the prevalence of prehypertension and hypertension in young adult medical students in Vietnam and try to correlate the blood pressure with known risk factors of hypertension. Research has shown an increase of hypertension in a population over 25 years old (Ha et al., 2014). This study was designed to evaluate if hypertension was present, and in that case how prevalent the hypertension is in a population under 25 years of age. Even though both SBP and DBP were measured, the study focuses on the SBP when dividing the participants into BP classes. This is done because of the higher CVD risk associated with SBP (Chobanian et al., 2003). Research has shown that some risk factors for developing hypertension are genetics, male gender, being overweight, stress, lack of exercise, diet, smoking and high intake of alcohol (Habib et al., 2015). The questionnaire that were handed out to the participants were designed to hold questions regarding known risk factors for hypertension. The purpose of the questionnaire was to get a broader understanding of which known risk factors the studied population were exposed to.

The study consists of 30 medical students. The quantity of participants was chosen to acquire a big enough population without having too much data to analyse for a bachelor thesis. The studied population is too small to be able to make any general assumptions regarding which risk factors that are affecting the blood pressure the most in the younger population. Due to the language barrier the examiners had difficulties communicating with the students. This resulted in a few minor problems that needs to be taken into consideration when analysing the collected data. The communication deficiency made it hard for the students to fully understand the purpose of the study and what was expected from the participant, even though the consent letter and questionnaire was translated into Vietnamese. The participants were supposed to rest for 10 minutes while being quite but due to communication flaws this was not achieved. Since some of the students were not resting and talking to each other during the resting period before the measurements, the examiners cannot guarantee that the measurements are the correct resting BP for the participant. Most participants were resting for approximately five minutes but were talking or laughing while the examiner was measuring the BP. The decrease in the resting time and talking before or during the measurement are two sources of error since both could lead to an increase in the BP (Frese et al., 2011). The participants BP were measured in the same order during the three appointments. The order could have affected the BP value due to that the

participants that were last had a longer rest before the measurement. Another factor which needs to be taken into consideration is the white coat effect. Even though the heart rate was not part of the data collection the examiners noted that some of the participants with prehypertension also had an increased resting heart rate, some even had tachycardia which means a heart rate of 100 beats per minute (BPM) or more (American Heart Association, 2018). An increased heart rate could be a sign of nervousness which could be caused by the white coat effect (Frese et al., 2011).

According to the study method the participants were not to know the value of the BP measurement before the end of the third measurement. Due to communication difficulties the participants did not understand the value of this information and tried to find out the BP measurement by looking at the BP monitor. If a professional translator had been used instead of the given supervisor this could have been prevented. Being aware of a high BP reading could lead to anxiety and could cause the following measurements to be increased as well without being pathological. If an auscultatory method had been used, this could have prevented the participants from reading the measurement on the monitor. Due to the examiners lack of experience in BP measurement, an automated BP monitor was used to prevent the sources of error which are caused by the performer.

The BP monitor used in this study is the right instrument to use for grading the classification of the BP. The BP monitor is designed to measure the BP at all ages. To guarantee validity, the right cuff size for the participant was used in the study. An automatic monitor was used because of the cuffs wide size range. By using this type of monitor, sources of error due to false cuff size were prevented. To exam the reliability of the BP monitor, repeated measurements were performed on the same person before the start of the data collection. This was done to guarantee a higher level of reliability. An automatic BP monitor indicate an exact value compared to an auscultatory method which could be read different depending on the performer. Therefore, the examiners selected the automatic monitor to acquire an accurate value which are not affected depending on the performer. The examiners are still students and lack experience in preforming BP measurement. Hence the automatic monitor felt like a more secure method when collecting the data. This due to its simplicity and swiftness compared to the auscultatory method.

The result of this study indicates that 53 % of the study population were normotensive, 40 % were prehypertensive and 7 % were hypertensive. Compared to Peltzer et al. (2017), the prehypertension and hypertension are more pronounced among the participants. In Peltzer et al.

(2017) 79.3 % were normotensive, 15.9 % prehypertensive and 4.8 % hypertensive among a population of 793 university students in Vietnam. This study has a significantly higher prevalence of prehypertension compared to the earlier study. One reason for this could be the study´s number of participants. If this study had consisted of a larger population the result could have been more equal to that of Peltzer et al. (2017). This study cannot make any assumption regarding the hypertension found, whether it is primary or secondary hypertension. Further medical evaluation is needed to establish the source of the hypertension.

Comparing the genders, the prevalence of hypertension was 7 % for both the males and the females. Comparing the prevalence of prehypertension among the different genders the examiners found that the females had a prevalence of 33 % while the male prevalence were 47 %. Almost every study participant (90 %) added some salt to the diet. The high salt intake from the sauces added to the food in Vietnam could be one variable for explaining the high prevalence of hypertension in the population. One of the questions in the questionnaire asked about the participants exercise habits. The question was "how many times a week do you exercise for more than 30 minutes?". The recommendation says that to lower the risk for hypertension a person should do physical activity that increase the heart rate for more than 30 minutes a day, five days a week (American Heart Association, 2017). Only five participants exercised seven or more times a week, four of these were classed as normotensive. The two participants classed as hypertensive only exercised one to two times a week. When analysing the collected data the examiners realized that the question regarding exercise might be misinterpreted. The question did not define what activities could be included as exercise. Therefore, the examiners do not know what activities the participants have included. Some may have included walking while others may only have included harder physical activities.

Out of the 30 participants in the study, 19 (63 %) had an inadequate amount of sleep of six hours or less per night (Fernendez-Medoza et al., 2012). However, both study participants with a BP measurement classified as hypertension slept for seven hours or more which could indicate that sleep habits are not effecting the BP of the studied population in a negative way. In the study, 16 participants claimed to feel stressed when answering the question in the questionnaire. This question was designed as a yes or no question and therefore only gave the examiners information regarding if the participants felt stressed or not. It did not give any information about the levels of stress the students experienced. It would have been better if the question were designed in such a way that the participants categorized their stress level from 1 to 5. The

question did not give any information regarding for how long period of time the student had been stressed. The examiners do not know if the stress were temporary or chronic.

This study could help improve the health of young Vietnamese and suggest that information regarding hypertension and the prevention of it should be distributed among the population in Vietnam, considering the high prevalence of prehypertension and high number of participants with heredity for hypertension in this study. The number of participants with heredity could have been larger, due to the fact that many citizens have hypertension without being aware of it. Development of CVD can be prevented by measuring the BP on a regular basis. If prehypertension can be detected at an early stage it can be prevented from developing into hypertension if certain pro-active measures are taken. These measures could be lifestyle changes such as more exercise, less salty food and quit smoking (Seravalle & Grassi, 2017; Collier & Landman, 2012; Peltzer et al., 2017). Measurement of the BP is a cheap, easily accessible method and BP screenings could lead to less development of CVD. One study suggested BP screening every second year in normotensive individuals and screening every year in individuals with prehypertension (Frese et al., 2011).

A limitation of this study is the small population used in the data collection and the fact that no statistical analyses were done. The researchers did not have enough knowledge about statistics or SPSS to be able to analyse the data collected. If statistical analyses were performed, conclusions about which risk factors that causes the most hypertension in young adults in Vietnam could have been drawn. The small number of participants make it hard for the examiners to make any assumptions regarding which of the risk factors that has the greatest influence for the development of hypertension. The prehypertension and hypertension groups are not exposed to more or higher known risk factors than the participants in the normotensive group. The participant's answers have been very diverse, and no common denominators can be found when comparing with other people in the BP class.

There are many known risk factors which the examiners are not considering in the questionnaire. The examiners could have analysed the blood of the participants to screen for a high cholesterol or a high blood sugar. If all known risk factors would have been analysed it would have been too much data for a bachelor thesis and therefore the examiners had to select the risk factors most suitable for a questionnaire. To screen the blood of the participants, equipment and access to a laboratory for analysis would have been required which would have been too expensive. This study suggests further studies on this subject. A bigger population

needs to be used and more risk factors need to be taken into consideration before any conclusions can be drawn. Other populations than students should be studied due to the higher knowledge of the human physiology and diseases among the medical students compared to individuals that have no medical training.

The aim of this study has been accomplished. The prevalence of prehypertension and hypertension among young adult medical students in Vietnam have been evaluated. Since no statistical analyses were done, this study cannot tell if one of the risk factors evaluated causes hypertension in a higher degree than other in the young population in Vietnam.

Conclusion

This study finds the prevalence of hypertension among medical students in Vietnam to be 7 %, with an additional 40 % of the students having prehypertension. More males than females were found to have prehypertension, but the prevalence of hypertension was the same between the genders. Due to the small population used and to the fact that no statistical analyses were done, this study cannot make any conclusion regarding which risk factors causing hypertension among young students in Vietnam. This study proposes further studies on the subject using a larger population and having more risk factors being taken into consideration.

Acknowledgements

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Appendix

Appendix 1 - Information and consent letter English

Consent letter

The extent of hypertension in young Vietnamese students

We are two students from Jönköping University in Sweden. We are here in Vietnam to write our bachelor thesis. We are going to study the blood pressure of students at Da Nang University of Medical Technology and Pharmacy. Our aim is to examine the prevalence of hypertension in young adult Vietnamese's students and try to correlate the blood pressure with known risk factors for hypertension.

As a participant of this study, you will have your blood pressure measured three times for one day, morning, noon and afternoon. Before the first measurement you will have to answer a questionnaire with questions regarding your life style, eating habits and exercise. This is done so that we can correlate known risk factors with your blood pressure. To eliminate all sources of error, you will not be able to know the reading of your blood pressure until after the final measurement.

All the collected data with personal information will be processed and all participants will be anonymous. This is all done on a voluntary basis. You as a participant can leave the study at any time during the study period, the authors will fully understand, and no questions will be asked.

If you have any questions, feel free to contact us!

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Date and place   Participants signature

_____   _____

PHIẾU ĐỒNG Ý THAM GIA NGHIÊN CỨU

Đề tài: Tình hình tăng huyết áp của sinh viên Việt Nam

Chúng tôi là 2 sinh viên của trường đại học Jönköping – Thụy Điển. Chúng tôi đang ở Việt Nam để viết luận văn tốt nghiệp cử nhân của mình. Chúng tôi sẽ tiến hành nghiên cứu về huyết áp của sinh viên trường Đại học Kỹ thuật Y – Dược Đà Nẵng. Mục đích của chúng tôi là xác định tỷ lệ tăng huyết áp ở sinh viên Việt Nam và tìm mối tương quan giữa huyết áp với các yếu tố nguy cơ đã biết đối với bệnh tăng huyết áp

Khi tham gia nghiên cứu này, bạn sẽ được đo huyết áp ba lần trong một ngày vào các buổi sáng, trưa và chiều. Trước lần đo đầu tiên, bạn sẽ trả lời những câu hỏi liên quan đến phong cách sống, thói quen ăn uống và việc tập thể dục của bạn. Đây là các yếu tố nguy cơ liên quan đến tăng huyết áp, vì vậy chúng tôi muốn tìm hiểu mối liên quan giữa các yếu tố này với bệnh tăng huyết áp của bạn nếu có. Để tránh sai số và đạt độ tin cậy cao nhất thì bạn có thể không biết được chỉ số huyết áp của bạn cho đến khi có được kết quả cuối cùng.

Tất cả các dữ liệu thu thập được với thông tin cá nhân sẽ được mã hóa và xử lý. Việc bạn tham gia nghiên cứu này là tự nguyện. Bạn có quyền từ chối hoặc dừng tham gia vào bất cứ lúc nào mà không cần phải giải thích lý do.

Nếu bạn có thắc mắc gì xin hãy liên hệ với chúng tôi.

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Ngày và nơi thu thập số liệu   Người tham gia ký tên

Đà Nẵng, ngày…. tháng…. năm 2018   _____

Appendix 3 - Questionnaire English

Questionnaire

1. Gender

   Male ☐   Female ☐

2. Age (years)

   _____

3. Height (cm)

   _____

4. Weight (kg)

   _____

5. Do you smoke?

   Yes ☐   No ☐

6. If yes, how many cigarettes a day?

   _____

7. Do you drink alcohol?

   Yes ☐   No ☐

8. If yes, how many glasses a week?

   _____

9. Do you consume drinks with caffeine?
(such as coffee, tea or coca cola)

   Yes ☐   No ☐

10. If yes, how many cups a day?

   _____

11. Do you eat fruit and vegetables every day?

   Yes ☐   No ☐

12. Do you add any salt sauce in your meal?
(for example: fish sauce, pepper salt, chili salt)

   Yes ☐   No ☐

13. How many times a week do you exercise for more than 30 minutes?

_____

14. Do you have known hypertension? (blood pressure higher than 140/90 mmHg)

Yes ☐   No ☐

15. Does anybody in your family have known hypertension (high blood pressure)?

Yes ☐   No ☐

16. Do you take any medication that can affect the blood pressure?

Yes ☐   No ☐

17. If yes, write the name of the medication

_____

18. How many hours do you sleep per night In general?

_____

19 Do you feel stressed?

Yes ☐   No ☐

20. How satisfied are you with your life on a scale of 1 to 5?
(1 – very dissatisfied 5 – very satisfied)

1 ☐   2 ☐   3 ☐   4 ☐   5 ☐

PHIẾU THU THẬP SỐ LIỆU

Xin bạn vui lòng cho biết thông tin bằng cách dánh dấu X vào các ô trả lời tương ứng hoăc điền vào chỗ trống.

1. Giới tính

Nam ☐   Nữ ☐

2. Tuổi _____

3. Chiều cao (cm) _____

4. Cân năng (kg) _____

5. Bạn có hút thuốc lá không?

Có ☐   Không ☐

6. Nếu có, bạn hút khoảng bao nhiêu điếu thuốc một ngày? _____

7. Bạn có uống rượu không?

Có ☐   Không ☐

8. Nếu có, bạn uống khoảng bao nhiêu ly một tuần? _____

9. Bạn có dùng đồ uống có cafein không?
(Bao gồm cà phê, trà và coca cola)

Có ☐   Không ☐

10. Nếu có, bạn uống khoảng bao nhiêu cốc một ngày? _____

11. Bạn có ăn rau và trái cây mỗi ngày hay không?

Có ☐   Không ☐

12. Bạn có cho thêm nước chấm có muối vào thức ăn của mình hay không?
(Ví dụ như nước mắm, xì dầu, muối tiêu, muối ớt…)

Có ☐   Không ☐

13. Trong một tuần có bao nhiêu lần bạn tập thể dục ít nhất là 30 phút/1 lần tập? _____

14. Bạn có bị tăng huyết áp không?   Có   Không

(Huyết áp lớn hơn 140/90 mmHg)   ☐   ☐

15. Trong gia đình của bạn có ai bị tăng huyết áp không?   Có   Không

            ☐   ☐

16. Bạn có uống loại thuốc nào ảnh hưởng đến huyết áp không? Có   Không

            ☐   ☐

17. Nếu có, bạn vui lòng viết ra tên thuốc đó: _____

18. Trung bình bạn ngủ khoảng bao nhiêu tiếng đồng hồ mỗi đêm?_____

19. Bạn có bị căng thẳng không (stress)?   Có   Không

            ☐   ☐

20. Bạn hãy cho điểm về mức độ hài lòng với cuộc sống
 của bạn theo thang điểm từ 1 đến 5:

           1   2   3   4   5

           ☐ ☐ ☐ ☐ ☐

(1 là hoàn toàn không hài lòng – 5 là rất hài lòng)

XIN CẢM CHÂN THÀNH CẢM ƠN SỰ THAM GIA CỦA BẠN!