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Circadian blood pressure within young adults in Viet Nam

An exploratory study comparing a normal blood pressure group and a prehypertension group

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Abstract

Hypertension is a global disease that many affected people in developing countries is not aware of. Hypertension is linked with cardiovascular disease. Prehypertension is not a disease but if not correctly treated, it could develop into hypertension. The aim of the study was to investigate if there are any differences in circadian blood pressure between two study groups, one group with normal blood pressure and one group with prehypertension. This study was an explorative study and its design is based on measurements of blood pressure values and a questionnaire was used to help get the data collection. 51 students volunteered to have their blood pressure taken from them and out of these 51, 24 were selected into two groups of 12 each for the Ambulatory blood pressure monitoring.

These 24 students would be a part of our study and an ambulatory (Schiller-102 plus) blood pressure monitor was used to collect the data. The prevalence of prehypertension findings in the clinical testing phase was 37% of the population. There was a variation between the groups during the day (systolic) but there was not a significant difference during the night.

Keywords: Prehypertension, ambulatory blood pressure, Blood pressure, oscillometric blood pressure

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1.0 Background

Hypertension is a common global disease. It is a high risk factor for cardiovascular and cerebrovascular disease. Cardiovascular and cerebrovascular disease is one of the largest mortality factors in the world. According to the World health organization cardiovascular disease represented 31% of global deaths year 2012 and $\frac{3}{4}$ of them took place in low to middle income countries (1).

A study made on blood pressure in Viet Nam says that about 25% of the Vietnamese population above the age of 25 has hypertension ($> 140/90$ mmHg). And 48% of the people with hypertension are unaware of this fact (2).

Prehypertension is classified as having blood pressure between 120/80 and 140/90. Having prehypertension is not a disease and thus does not require pharmaceutical treatment. It could however be good to inform the patient what lifestyle changes can do for their life expectancy and reduced risk of getting hypertension as well as other diseases that go along with hypertension. Changes such as quitting smoking, reduced alcohol consumption, more physical activity, and healthier food options reduces the risk of hypertension (3-5).

The goal would be to get information about risk groups for developing hypertension, and whether it is possible to find any differences that can give a better picture to identify risk groups and how to follow them so that hypertension could be avoided (2-5).

1.1 Blood Pressure

BP is the hydrostatic force exerted against the vessel wall by the blood. BP is measured in millimeter mercury (mmHg) and is divided into 2 components, the systolic pressure and the diastolic pressure. BP is dependent on 3 major factors: cardiac output, blood volume and vascular resistance.

Cardiac output could be shortly described as (mL of blood / min) determined by stroke volume (ml / beat) and heart rate (beats / min) (6, 7).

Blood volume is normally about 5L and changes due to moderate bleeding, which can be compensated for by homeostatic mechanisms. There also are fluid reentry in the kidneys and colon, this can also cause changes in blood volume (6, 7).

Vascular resistance is opposite to blood flow and is equal to the friction between blood and vessel wall, it is dependent on lumen size of the blood vessel including compliance and conductance and vasoconstrictors and dilators. The main center of regulating is the vasomotor center in the brain stem. Blood viscosity is mainly dependent on erythrocyte concentration in the fluid plasma, higher viscosity gives higher resistance. Total blood vessel length is proportional to the resistance, the longer the vessel the more is the resistance and obese people have additional blood vessels in the adipose tissue it is estimated that 650 extra kilometers is developed per extra kilograms of fat (7).

Conductance is a measure of blood flow through a vessel for a given pressure difference. This is expressed in milliliters per second per millimeter of mercury pressure. Even the smallest change in BP could (change the vessels ability to conduct blood when the blood is streamlined; Which means that vessels can increase in size to take on more blood. This is known as Poiseuilles law and is possible because of the concentric muscular rings inside the vessel wall. Blood near the vessel wall flows in a slower speed and therefore blood centralized in the vessel has a higher blood flow. This makes it possible for the arterioles, responding with only small changes in diameter to nervous signals or local tissue chemical signals, either to turn of the blood flow to the tissue or making it increase and this will lead to more blood intake (6)

1.1.1 Prehypertension

Prehypertension is defined between 120-139/80-89 and there are different risk factors that can cause prehypertension. A study has showed that people with prehypertension had higher body mass e.g., bigger waist circumferences. It also showed that excess fat, especially obesity is established from hypertension (8, 9).

Prehypertension is a stage that might seem harmless. It is on the verge to hypertension that is classified as a disease. A study Aronow S. W (Threating hypertension and prehypertension in older people; when, whom, how- 2014) showed that prehypertension is a significant risk factor for developing hypertension and that prehypertension is known to have a signification of causing Coronary artery disease or Myocardial infarction independently from the progression to hypertension. However they did not find a connection between prehypertension and stroke independently from the progression of prehypertension to hypertension. On the other side other studies has showed that prehypertension, even at the lowest range is a big risk for cardiovascular disease (10). Prehypertension should be treated by lifestyle changes before anti-hypertensive drugs. It's important to change lifestyle in order to prevent oneself to get hyper-

tension. Being overweight is one of the main causes for prehypertension as well as hypertension. (5, 9, 10).

1.1.2 Hypertension

When someone is diagnosed with hypertension, it means that his or hers (**her**) arterial pressure is greater than the upper border of the accepted normal measurement. Hypertension is a disease that needs medical treatment such as anti-hypertensive drugs, and life style changes. The lethal effects of hypertension are caused mainly in three ways: Excess workload on the heart leads to heart failure and coronary heart disease. Result of this is usually resulting in death by(heart attack (1, 6, 11).

High BP could damage blood vessels in the brain, this might cause a cerebral infarction and depending where it damages it could lead to multiple brain disorders.

High BP could also damages the kidneys. This leads to renal destruction, eventually kidney failure, uremia and possible death. The kidneys have much to do with BP regulation. This is because the kidneys depend on even blood flow in order to function and filtrate (filter) the blood. From the kidneys the Renin angiotensin aldosterone system activated by renin are released to control the BP. High BP can cause kidney damage (6, 9, 12).

1.1.3 Lifestyle-changes to prevent hypertension

There are certain changes one should do to prevent the risk for prehypertension to get hypertension. Changes such as, low alcohol consumption quit smoking, weight reduction and frequent exercise. Obesity is a common factor for pre-hypertension groups. Thereby it is important to eat smaller portions, especially food with excess salt and LDL cholesterol content in it. People that have obesity may need the support of a dietary plan. But one crucial thing is physical activity (11). Guidelines show that there should be at least 30 min of activity, most days in the week. Thus it is important not to take anti-hypertensive drugs at first when having prehypertension. Different lifestyle criteria should be considered and motivated so that the patient never has to take medication or at least delay pharmaceutical treatment when it comes with the risk of side effects (14).

1.2 Ambulatory blood pressure

Ambulatory blood pressure (ABP) differs from clinical oscillometric and auscultatory BP in way such that, ABP is done in a home environment and takes measurements during a longer time span, approximately under 24 or 48h. This makes it possible to see an average mean of the BP during the 24 or 48h. When using ABP is that phenomenon like white coat hypertension can get erased from the picture. It gives a better understanding about how the BP varies during the day and during the night and how the pressure is in a non-clinical environment. ABP is ideal for evaluation of changing life styles and the effect of anti-hypertensive drugs (8). ABP monitor used for this study is a Schiller 102 plus. ABP with Medilog Darwin v2 makes it possible to follow the approximate time during a day that the patient is above a certain BP value and this is helpful in order to see the percentage during a day of vessels having a higher strain during a day. It is possible to see variation in BP. One a common term for one of these variations is Dipping and is explained as the reduction of mean pressure from day time compared to night pressure (8, 12).

No index entries found.1.2.1 Hormone regulation

Sleep is another major factor to retain normal BP. Sleep is necessary as lots of hormones are released during the night. One of those hormones is cortisol.

Cortisol is a stress hormone and one of its functions is to control BP and the heart rate. This hormone is usually active between four in the morning until ten in the morning. Cortisol helps us

wake up, and is always active if one is stressed during the day. Just in in another words bad sleep and being stressed is going to make the heart go up in frequency because (as) it is a stress hormone (6,12).

Serotonin is one “feel good” hormone. This hormone keeps people, happy, calm and gives a good feeling about themselves. If individuals are having trouble sleeping there will be less serotonin in the blood. This can affect the heart and the cardiac output (6).

Parathyroid releases a hormone called parathyroid hormone (PTH). A hormone such as PTH can make a difference. A recent study has showed that there was a correlation between elevated BP and PTH in the blood system, with people who having vitamin D disorder. Another study had showed that people with higher PTH are at higher risk for CVD mortality. There might be explanations why PTH has an effect on the elevated BP. It could act on cardio myo-

cytes to promote left ventricle hypertrophy. It also may affect chronotropic pacemaker cells (6,15).

1.2.2 White coat hypertension

It is widely accepted that BP measured in clinical environment usually overestimates BP measured in nonmedical settings and that BP varies differently from one patient to another. A group with mild hypertension where the BP is high at one medical setting has been identified as having white coat hypertension and this is about 20 % of the hypertensive patients. So it is logical to think that ABP will give a more precise value of the BP than just one clinical test (11). But white coat hypertension (WCH) can also correlate with cardiovascular disease (14). Martin A. C, Magrath P. B, 2015 did show that white coat hypertension is more likely to develop a sustainable hypertension and diabetes compared to normotensive patients (8, 14). But also that metabolic risk factor such as obesity is a major risk factor for white coat hypertension developing into hypertension. People with WCH should focus on the metabolic risks, glucose intolerance and instead of BP alone. The best possible way to identify WCH is with ABP so a patient can have more BP measurements during 24H, but it is also important to keep in mind the different life styles that might cause this (8,14).

2.0 Aim

The aim of the study is to investigate if there are any differences in circadian BP between two study groups, one group with clinical normal BP and one group with clinical prehypertension in young adults from Vietnam

3.0 Method

3.1 Design

The study followed an exploratory design and was based on BP measurements and this study was done in Vietnam, Da Nang. The population was selected by accessibility of volunteering students from two school classes. The study group consists of young adults in the range of 18 – 25 years of age, they are all students at Da Nang University of Medical Technology and Pharmacy. 51 students volunteered to have their BP taken and out of them 24 were divided into two groups of 12 each for the ABP monitoring.

Inclusion requirements for the study group for the ambulatory part of the study were:

Age between 18 and 25 years, the participants can't eat blood- pressure-regulating medicine ordinated to lower their BP and shall have a BP value that does not count as hypertension.

They weren't excluded for taking headache pills, Non-steroidal anti- inflammatory drugs or natural remedies and these factors wasn't controlled. They must in the selection phase have prehypertension or normal BP depending on the study group they are included into (3,4).

The data collected was demographic data and information collected in the form of a questionnaire that is tied to the BP values collected with Omron M3 and Schiller-102 plus. The Study group was divided into a study group and a control group to look for differences in their BP or data affecting BP and as well as the benefits of using an Ambulatory monitoring.

3.2 Equipment and methodology

The automatic oscillometric sphygmomanometer Omron M3 was used to divide the students into two study groups that meet the inclusion criteria. Two BP measurements were taken per person to create a group of students with prehypertension and a group with normal BP. Omron M3s manual was used to ensure methodology (16, 17). The cuff was however placed on the right arm and an extra consideration was given to the inflation tubes position that could get stuck under the elbow with this machine when measurements were taken on the right arm (17).

Mainly Omron M3 is used to get better reliability in the results since auscultatory method has a higher error marginal risk of due to the human factor when taking the BP measurements (17). For the 24 students who were selected for the study and control group an ABP monitor a Schiller BR-102 plus was used. This is also an automatic BP monitor however it takes measurements in an outside clinical environment and takes measurements during 24h timeframe. For the study it took measurements every half hour during the day and every hour in-between 22:00-06:00 Schiller is made in Switzerland and it has been proven to work correctly (18). As a part of the methodology in ambulatory monitoring an activity diary and control questions were added and is shown under appendix. The software for evaluation is medilog DARWIN28 (16).

3.3 Data collection

At the beginning of day one of the data collection, a class of students got informed of the study from a translator about the study into Vietnamese. This was to ensure that everybody could understand the purpose of the study and whereby 27 of 55 students volunteered. The students waited at least 30 minutes in a waiting room at the school clinic before entering a quiet room to rest another 5 min before having the pressure taken. They came in two and two's. BP was then taken on the both of them. After taking the first BP they rested at least for another three minutes before the second measurement was taken. On the second day the next class came and 24 of 61 students did the same procedure as the students from day one (19, 20).

The mean value of the two BP measurements determined the BP that was used to select students into the prehypertension group or the normotension group. For the 51 Students that had their pressure taken a seminar was conducted about the study and information regarding the inclusion criteria's, BP and what the benefits of ABP can give. Continued information that their participation is voluntary was also given and that the participants could withdraw at any-time. Of the 51 students 24 were selected and if anyone would refuse, the following student would be asked. As a part of appreciating both classes involvement the selections are made from both classes. 3 students refused at this stage and 1 had medicated hypertension so there for the next following 4 were collected.

The Ambulatory data collection started and a medical doctor assisted in the translation of the questionnaire as well as describing information about the method and answering questions. For gathering ambulatory BP data the machine and cuff were applied to the student. The stu-

dents were informed on how to fill in the questionnaire and the first part of the demographic questions was answered. This made it possible to see if some of the students were using anti-hypertensive drugs as treatment for hypertension. The procedure of the monitoring was described with the importance of letting the left arm being extended when the machine takes the BP and the importance of information such as sleep and waking up and other activities. This so adjusting the data collected to the time the student goes to bed and wakes up to give a more accurate time for daytime BP and nighttime BP. In the morning when they returned, they handed in the questioner and the ABP machine was taken off the students. They were asked how the day was and if they felt any complication from the examination had occurred such as bruising or pain. The questionnaire was received. The BP cuff was washed with soap and water to be cleaned (18, 21).

Of the 24 students that participated in this stage of the study 23 completed the full study. 1 one completed the questionnaire but aborted the ambulatory monitoring. (18).

3.3.1 Statistics

The data we collected was analyzed and studied.

For analyzing and presenting the results in this study, Microsoft Excel 2007 USA, Redmont Washington and SPSS IBM USA Amonk, New York is used. The signifikans was at 5 %, P 0.05

3.4 Ethical considerations

We have informed the study subjects that participation was voluntary and that they may reside from involvement during any part of the study. Participation were anonymous and we did code the test results and survey together and have that tied to their name so we could give them the results of the test if they want it. We have done a self-reviewed examination of our ethical considerations (according to the formula “Etisk egenanskning” from the School of Health Sciences). If there were any phatological findings a doctor was accessible at all times.

4.0 Results

The result of this study involves two classes of students from Da Nang University of Medical Technology and Pharmacy that had their BP measured. The students came from Da Nang city and rural areas surrounding Da Nang, Vietnam. From class one, a class consisting off 55 stu-

dents, 27 volunteered and class two consisting 61 students off which 24 volunteered. As a part of the selections process only resting BP was measured and to minimize biasness we did not collect any other data at that stage.

In Figure 1 the mean BP of two measurements is shown from all of the participants from the two classes. The average BP for systolic BP in the first days measurements is $120 \text{ mmHg} \pm 13,8 \text{ mmHg}$ and average diastolic BP is $66 \text{ mmHg} \pm 9,5 \text{ mmHg}$ and the second day had the average systolic BP up to $116 \text{ mmHg} \pm 8,4$ and the diastolic BP was $68 \text{ mmHg} \pm 5,6 \text{ mmHg}$. Table 1 and 2 shows the ABP measurements for prehypertensive and normal BP group participants. Table 1 and 2 describes amount of measurements that were taken during BP, but also the $\text{SD} \pm$. From these values calculations of the average pressure for each group and presented in figure 2, 3, 4 and 5 as well as calculated in spss to get see if our results and if the groups where significantly different in pressure. This was presented in table 3. With a significant value of 5% we got systolic daytime group differences $P=0,001$ diastolic daytime differences $P=0,006$ and nighttime systolic and diastolic differences not to be of any significant difference in-between the groups.

Of the 24 students that participated 23 completed the ambulatory data collection including the questionnaire, which gives some demographic data of the groups. In the prehypertension group there were 9 male and 2 female aged in-between 19-21. Of the 11 students only 2 knew if anyone in their family had hypertension and 1 smokers representing 8,3% smokers in the prehypertension group, 6 comes from rural area and 5 from the city area. Trying to get some information on how the examination day was experienced a question was asked, if the day resembled a typical day in their life and 2 answered that it had not been a typical day, a follow up question was asked to describe what was different from a normal day was asked and of the 2, one did not answer and one had a fever and slept a lot.

The normal BP group was 12 female students in aged between 18 and 20. In this group 4 of 12 people knew of hypertension in the family which is more than the prehypertension group no one smoked 10 came from the rural area and 2 city. 2 in this group did not have a typical day one had missed breakfast and lunch and another woke up during the BP measurement at night.

The Average BMI of the groups was 20,6 in the prehypertension group and 19,4 for the normal BP group.

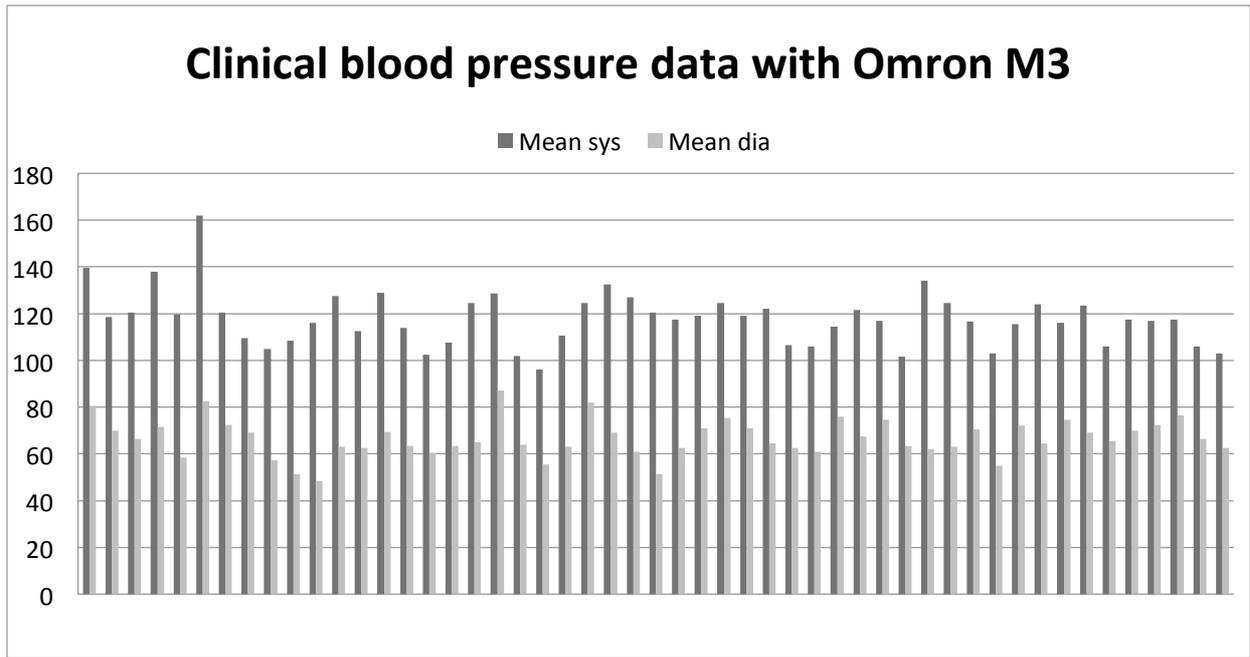


Figure 1: This figure describes mean systolic and mean diastolic BP between two classes that was taken with an Omron M3

Studygroup difference Mean systolic pressure daytime

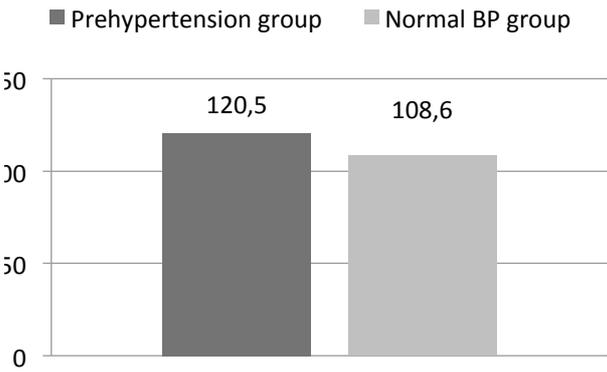


Figure 3: This figure describes the mean systolic BP with the prehypertensive group and normotensive group

Studygroup difference mean diastolic pressure daytime

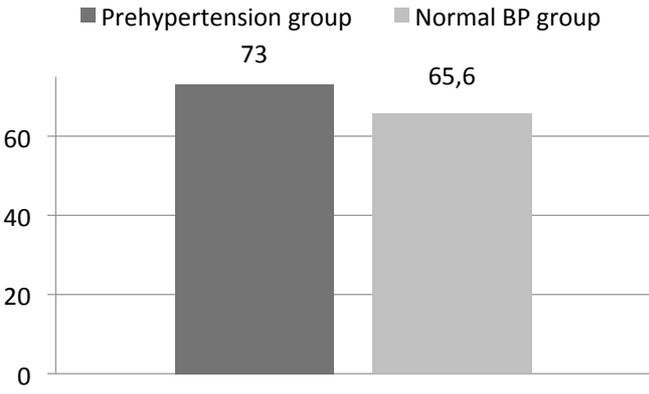


Figure 2: This figure describes the difference in mean diastolic BP between the two groups

Studygroup difference mean systolic pressure nighttime

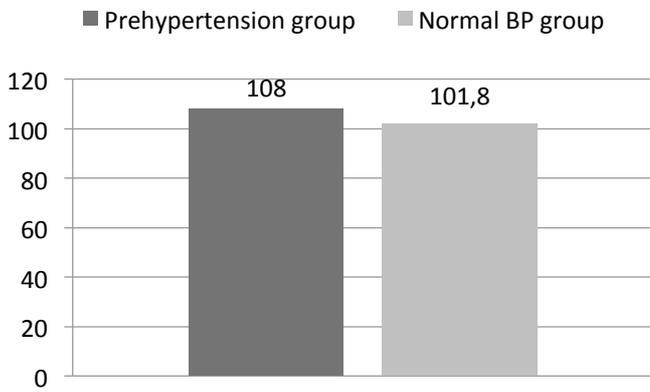


Figure 5: Describes the mean systolic BP during nighttime between rehypertensive and normotensive group

Studygroup difference mean diastolic pressure nighttime

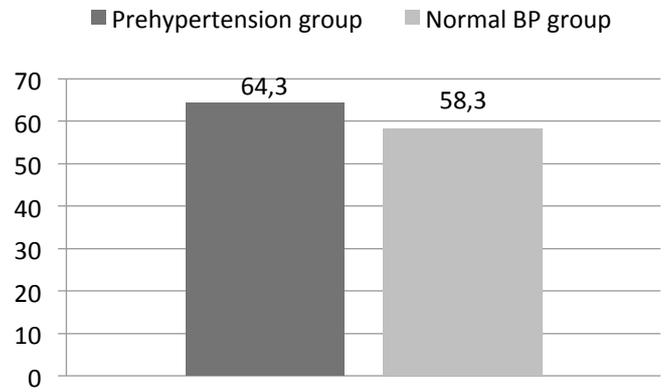


Figure 4: Describes the difference in diastolic BP during nighttime between prehypertensive and normotensive group

Figure 5: Table 1 describes Systolic BP during daytime between prehypertension group and normotensive group

Systolic BP Daytime

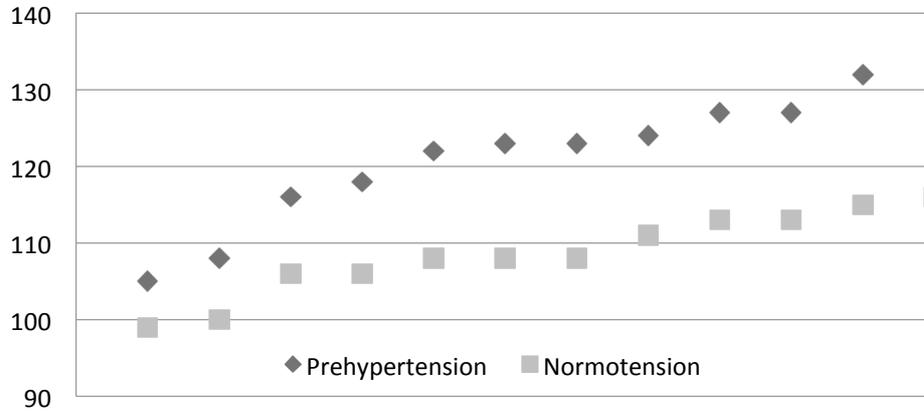


Figure 6: Describing the diastolic BP during daytime between the two groups

Diastolic BP Daytime

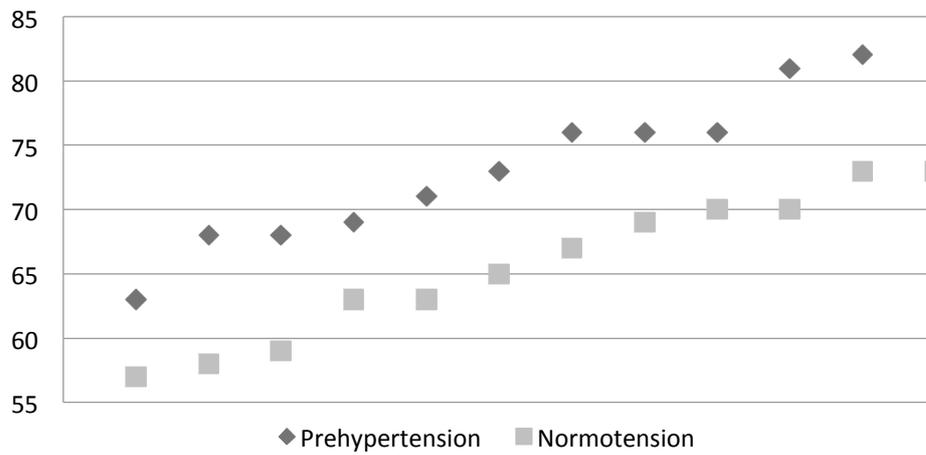


Figure 7: Table 3 describes the diastolic BP during nighttime between the two groups

Diastolic BP Nighthtttime

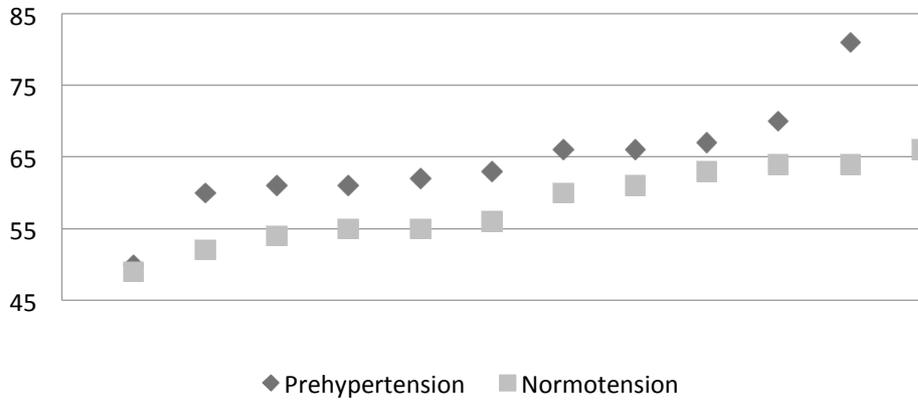
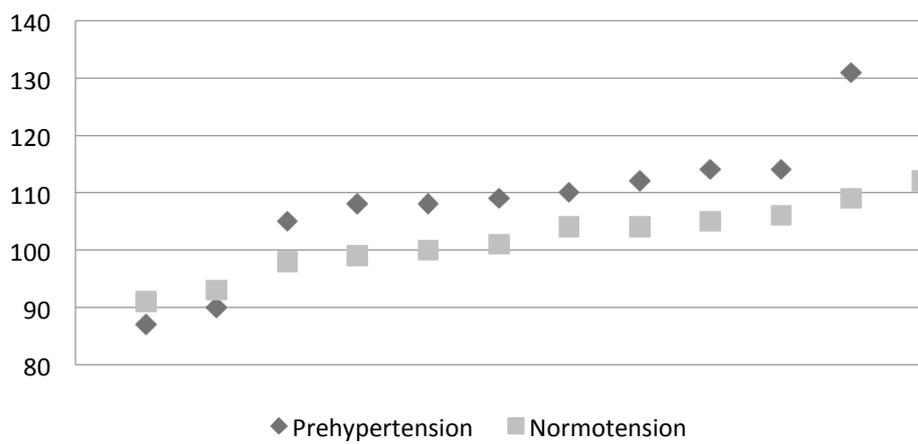


Figure 8: Table 4 shows the systolic BP during nighttime between the two groups, prehypertension and normotensive group

Systolic BP Nighthtime



5.0 Discussion

5.1 Method and result discussion

This exploratory study was a result of an eleven week long research that extended from the beginning of March until the end of May 2015 in Da Nang, Viet Nam.

The aim of the study is to measure BP and compare it between groups. This is a quantitative study and results in more knowledge about young adult's BP in Viet Nam, Da Nang city area and rural area surrounding Da Nang. It is done as a follow up on a previous bachelor thesis focusing on prevalence of hypertension and as well as prehypertension in young adults. This study focuses on variation night and day BP in-between students with prehypertension or normal BP. This was done to find if these young adults and the different clinical groups divisions are separated with the ABP measurement as well and also to see if they also have difference in the circadian 24h cycle that we divided into daytime and night-time.

Finding any factors as dipping or occurrence of BP load above a certain border values was also something were to get results about would be good. Dipping was one value we got interested in however none dipping can be caused by a lot of different things such as Diabetes, renal disease, depression, medication and nocturia and looking further into all these factors within young adults might not be ethical and would take us away from our main focus which is to see if there is a variability in-between the two study groups mean values during the whole day.

We have learned a lot about ABP. Its function why it is so easy to use but also the most important thing is that it helps people know how much their pressure was at maximum and minimum, how it varied during the day and night how often it goes above certain border values however since we don't yet have a good enough understanding about border values for young adults we feel this result needs a larger sample and broader spectra of young adults in-order to form new border values for the young adults category. These border values from Medilog(18) seemed to be fitted more too evaluating hypertension and medication or lifestyle changing results as a follow-up to the prevention of cardiovascular incidences.

It is good with ambulatory measurement that making it is effective, proving it has safety systems to ensure that the measurement is taken correctly and it is done in a home environment. In which the patient actually lives in and it is done by a machine and can be applied fairly quickly. The most important thing is the communication and information about the require-

ments of letting the arm to be extended and relaxed during measurements and that the questionnaire is easy to understand.

Before the first BP measurements, the students who participated were informed to be still and stay quiet during the five minutes duration of rest. However this was not followed by all the students, some talked during this time regardless. The students who talked may have their rest disturbed, and this might affect the BP values and lead to increased BP, that could give a false to high BP, WCH (21).

To separate the two groups an oscillometric (Omron M3) was used. The students rested for five minutes before the measurement and additionally for another three minutes for the next measurement Arm was placed in heart elevation before blood pressure taking (19). In this study awareness of methodical choices made were done to give the study trustworthiness as much as authenticity. Choosing the oscillometric BP gave the study reliability were the human factor for mistakes was reduced (23). Using the auscultatory BP, would depend on how good we as individuals are at registering the BP. Oscillometric BP could give us more reliable and accurate measurements.

It has been shown that the ABP should be placed on the non-dominant arm (22). In this study it was not possible to do so, that because as we only had access to one ABP cuff and the cuff which was for left arms. Putting the cuff on the left arm with an individual who is left handed could affect the BP results taken during 24h. Why it's good to use the non-dominant arm is, it's good to make sure that individuals can use their dominant arm not disturbing everyday life. A study has shown that it can also affect the arm the cuff is placed on (22). What could've been done better, we should have asked who was left handed and who right handed in-order to know how much of a falsification factor there really was.

The ABP is a BR-102 plus (Schiller AG Switzerland). This is a reliable ABP that has been approved by the European society of hypertension (24). ABP manometer was programmed to take measurements every one-hour between 22-06.00 and two times an hour between 06.00-22.00. The thing that might be problematic factor with this; that those who participated in the study could have relaxed and prepare them for the measurement. The optimal way to avoid this would be that the measurement would be by randomly taking measurements in those 30 minutes (25). This might be a more accurate way or at least a more secured way to assure that

no one is preparing themselves for a new measurement. Also the amount of measurements were reduced in-order to reduce the risk of bruising or pain for these healthy students volunteering in the study even though it make our data less reliable.

In the questionnair a marker where they did wrote down when they went to bed and when they woke up. What was the noticeable factor was that during the weekends, some the of participants went to sleep late and woke up very early. Some of the students barely got about three hours of sleep As known, sleep deprivation can cause variation in increasing BP, These students did mention that their day to be of a normal state. Which is okay, though this little sleep might have affected their BP, such repeated behaviour could lead to cardiovascular disease in the future (26).

Limitetions with this study were time and ABP machines. Getting the two groups took two days, and the ABP monitoring took additiona 25 days. It is also important to adjust to the student's schedule, this made us flexible about the time for ending the study. The students volunteering also made an enormous contribution some even came (coming) in during the weekends witch made the study possible to follow through according to our plan A. A backup plan would be to reduce the population size which wasn't required

Communication has been one of the biggest challenges. Most of the times we have had translators. However it is not always easy making yourself understood even with a translator when languages and culture can become a hindrance. Sometimes it's easier to say yes I understand and try then to request clear and precise information and especially if the same information is repeated again in the same way. Sometimes it felt like there was a reluctance to question our information when it was not understood however a lot was clear and easy to understand yet some questions did not seem to make sense, for example; the one about how there day had been (etc.) some filled it saying it was good before the ABP monitoring had already started even though it says examination day in the questionnaire. It has been a challenge to give clear information and also to receive good feedback saying that the information was delivered other than yes I understand, but also perhaps why they understand, also not giving too much information making possible bias. One example (for example;) was the question 9 again has the examination day resembled a typical day in your life. We informed that we wanted them to live a day as any other day do what they usually do and live the way they do ordinarily and

sometimes we got the feeling that this information could affect the answer of the question 9. Other thoughts were that the questionnaire could be more clearly about that resting and sleeping siesta as well as could be good to write down in the activity list.

Vietnam is a fast developing country and (which) has stroke as its main cause of death and it is followed by heart disease. The awareness needs to be increased on BP and effects of untreated Hypertension in Viet Nam. Risk factors needs to be considered and Lifestyle effects. Screening the older population and to raise awareness of Hypertension with its damaging effects would be good. Making anti-hypertensive drugs more available for all people with hypertension is also to be considered (27).

During the clinical testing phase as many as 37% had prehypertension most of them only the Systolic value.

In this study the sample consists of 24 students both male and female from Da Nang city and rural area. 12 students had normotensive BP and 11 students had prehypertension. The comparison between the groups was to show a study group difference in mean systolic BP during daytime and mean systolic BP during night. During the daytime the mean systolic BP at the prehypertension group was 120.5mmHg. The mean systolic BP with the normotensive group during daytime was 108.6 mmHg. What is also presented is the mean diastolic BP during daytime and mean diastolic BP during night. The mean diastolic BP during night time with the prehypertension group was 73 mmHg. The mean diastolic BP during night with the normotensive group was 65,6 mmHg.

The results from the comparison were tested with T test 5% significance level. The results show systolic daytime group differences $P=0,001$. Diastolic daytime $P=0,006$ and nighttime not to be any significant difference between the groups. This could be due to few measurements during the night and that the students actually did not sleep for so long giving us fewer measurements to ensure the difference.

This shows that there is in fact a difference not only tied to white coat hypertension but also that in young adults it shows a larger difference in daytime BP between the groups we can only guess but probably the difference lies in stress reaction stimuli to everyday life activities,, and would be interesting to find out more about. It is also interesting to reflect as to the diastolic difference was not as high whereas the mean was not above 80 either perhaps diastolic pressure is not yet as affected yet effect in the young adults. There is a majority of boys

in the prehypertension group and only girls in the selected normal BP group that could be interesting to look into over a larger population. More people in the normal BP group knew of family member with hypertension than in the prehypertension group now this may not mean that the family has hypertension and doesn't know of it however it is only, recently a study was published finding that of the 25% of the population in Viet Nam only 48% of them knew about it and this is alarming when talking about preventing the cause of Vietnams major causes of death Stroke and Heart disease (2). There was also a difference in BMI 20,6 in the prehypertension group and 19,4 in the normal pressure group, making the difference to (1,2.)

5.2 Conclusion

The prevalence of prehypertension findings in that, clinical testing phase was big 37% (19/51) of the population. There was a variation between the groups during the day but there was not a significant difference during the night. We expected there to be a difference that followed the clinical type measurement but yet it did not differ significantly during the night leading to the fact that they are still young adults and the body can still compensate in most cases.

6.0 Acknowledgments

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It has been delightful being a part of Da Nang University of Medical Technology and Pharmacy during these eleven weeks experience. The schools, staff, students, all have greeted us

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8.0 Appendix

8.1 Information and Consent letter English

Information and Consent letter to participants

High blood pressure values are a global issue linked to cardiovascular disease. A previous study has shown that one of four Vietnamese citizens above the age of 25 years old has hypertension and about half (48 %) of them were not aware of their high blood pressure. This would mean that 11 million Vietnamese citizens have high blood pressure and 5.7 million of them are not aware of it. Our aim is to study blood pressure on young adults below the age of 25. This will result in an academic bachelor report.

To do this you are a valuable part as a healthy young adult that does not have hypertension. However, some of you have what is called prehypertension and it's not a disease but a risk factor for getting hypertension. We wish to see if there are any conclusions we can get from ambulatory 24h blood pressure monitoring.

You will have your blood pressure measured. We estimate the total time for each participant will take about 24h however we have reservations for data loss or technical problems we might ask for one more 24h study.

This study will contain some risk of bruises but you should be able to live a normal day with the exception of letting your left arm hang down and it taking measurements every 30min during the day and every hour during the night. Your care will not be affected by the results however you will be able to act on the data if you so wish.

In order to secure your confidential names and social security number **will not** be included in the results of the study. Your personal data will only be tied to you indirectly through the questions you answer in the survey and the survey will be linked through a number given to you when taking your blood pressure.

It is voluntary to participate in this study and it is possible to abort the study at any given time and no reason is required for aborting the study.

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Information and Consent letter to participants

I have received the information, I understand the content of the study and I choose to participate on voluntary basis.

Name: _____

Date: _____

Signature: _____

I wish to receive information about the result of the study, please send me a copy (in English) to this e-mail

address: _____

8.2 Informed consent letter Vietnamise

Thông tin và thư chấp thuận tham gia.

Giá trị của cao huyết áp là một vấn đề toàn cầu liên quan đến bệnh tim mạch. Một nghiên cứu trước đây đã chỉ ra rằng một trong bốn công dân Việt Nam trên độ tuổi 25 đã bị cao huyết áp và khoảng một nửa (48%) trong số họ không biết về bệnh cao huyết áp của họ. Điều này có nghĩa rằng 11 triệu dân Việt Nam có huyết áp cao và 5,7 triệu người không nhận thức được nó. Mục đích của chúng tôi là nghiên cứu huyết áp đối với người trưởng thành ở độ tuổi dưới 25. Điều này sẽ là kết quả của một báo cáo cử nhân khoa học.

Để thực hiện việc này thì bạn sẽ đóng một vai trò quan trọng như một người trưởng thành trẻ tuổi khỏe mạnh mà không có cao huyết áp. Tuy nhiên, một số bạn có tiền cao huyết áp và nó không phải là một bệnh mà là một yếu tố nguy cơ mắc bệnh cao huyết áp. Chúng tôi mong muốn để xem nếu như có bất kỳ kết luận nào chúng ta có thể nhận được sau 24 giờ theo dõi huyết áp một cách lưu động.

Bạn sẽ phải đo chỉ số huyết áp. Chúng tôi ước tính tổng thời gian cho mỗi người tham gia sẽ mất khoảng 24 giờ, tuy nhiên để đặt phòng việc mất dữ liệu hoặc các vấn đề kỹ thuật khác nên chúng tôi có thể yêu cầu một nghiên cứu nhiều hơn 24 giờ.

Khi tham gia thực hiện nghiên cứu này sẽ có thể gây ra một vài vết bầm tím nhưng nó sẽ không ảnh hưởng tới cuộc sống bình thường của bạn ngoại trừ việc duỗi cánh tay trái của bạn xuống và máy sẽ tự động bơm để lấy số đo cách 30 phút một lần vào ban ngày và cách 1 giờ một lần vào ban đêm.

Để đảm bảo bí mật về tên và những thông tin cá nhân của bạn sẽ không được đưa vào trong các kết quả của nghiên cứu. Dữ liệu cá nhân của bạn sẽ chỉ được gắn chặt với bạn một cách gián tiếp thông qua bộ câu hỏi điều tra mà bạn trả lời.

Việc tham gia trong nghiên cứu này là hoàn toàn tự nguyện và nếu như bạn không thể tiếp tục tham gia thì bạn có thể hủy bỏ nó và báo lại cho chúng tôi tại bất kỳ thời điểm nào.

Những người có trách nhiệm trong nghiên cứu này:

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Thông tin và thư chấp thuận tham gia.

Tôi đã nhận được thông tin, tôi hiểu được nội dung của nghiên cứu này và tôi chọn tham gia trên cơ sở tự nguyện.

Họ và tên: _____ Ngày: _____

Chữ ký: _____

Tôi muốn nhận thông tin về các kết quả của nghiên cứu này, xin vui lòng gửi cho tôi một bản sao (bằng tiếng Anh) đến địa chỉ e-mail dưới đây:

Địa chỉ: _____

8.3 Questionnaire and logbook

Examination Nr: _____ Examination date: _____ Examination start/end-time: _____

Demographic data and questions	Answers	
1 Male/Female?		
2 Length in cm?		
3 Weight in kg?		
4 What is your age?		
5 Do you smoke?	Y	N
6 From rural or city area?	Rural	City
7 Do you have medicated hypertension? (Medication for Blood Pressure)	Y	N
8 Does anyone in your family have known hypertension?	Y	N
9 Has the examination day resembled a typical day in your life?	Y	N
10 If No in Q9 describe what was different in the box.		

