# HOW DOES STRESS CAUSE THE BLOOD PRESSURE INCREASED ?

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## Abstract

Background: Hypertension is a major risk factor for cardiovascular diseases which is the leading cause of death in Indonesia. The prevalence of hypertension in Indonesia (based on blood pressure measurements) is very high, namely 34.1% of the total adult population. Research Objectives: To determine the effect of stress on the incidence of hypertension

Methods: This research is an analytical observational with case-control, then a qualitative study is conducted using in-depth interviews using a questionnaire tool, while the stress level assessment uses the Hamilton Anxiety Rating Scale (HARS). Research implementation in the City of Mataram and the City of Surabaya. The population of 208 respondents. The sample selection technique is purposive sampling.

Result: statistical test α = 0.000 <0.05 means that there is a correlation between stress and the incidence of hypertension.

Discussion: When there is stress, the body releases stress hormones, namely adrenaline, cortisol, and norepinephrine, which cause an increase in heart rate and a stronger contraction of the heart muscle.

Suggestions: for avoiding stress by keeping yourself busy with positive activities and doing regular physical activity.

## Keywords:

Stress, Increased Blood Pressur

## Background

Hypertension is a major risk factor for cardiovascular diseases which is the leading cause of death in Indonesia. Hypertension is still quite high and tends to increase along with a lifestyle that is far from a clean and healthy lifestyle and the high cost of treating hypertension (Riskesdas, 2018).

WHO data shows that around 1012 million people or 29.7% of the earth's inhabitants have hypertension (Adriansyah, 2010). This figure is likely to increase to 32.5% in 2025, and Riskesdas 2018 data shows that the prevalence of hypertension in Indonesia (based on blood pressure measurements) is very high, namely 34.1% of the total adult population. The increase in the prevalence of hypertension was followed by an increase in age. According to some survey results, it is around 5 - 10% in adults and more than 20% in the age group 50 years and over and the incidence is more in women, namely 36.9% than men, only around 31.3%.

West Nusa Tenggara Province ranks 3rd after Riau and Bangka Belitung Provinces, with 148,958 incidents and data from the Mataram City Health Service, it is reported that the number of hypertension sufferers in 2018 was 35,750 cases in all areas of Mataram City and the Cakranegara Puskesmas area, the number of hypertension patient visits as many as 2951 cases. (Mataram City Health Office, 2015).

Government efforts to prevent non-communicable diseases, one of which is hypertension, is Presidential Instruction No. 1 of 2017 concerning the Healthy Living Community Movement (GERMAS) which focuses on three activities, namely: 1) Doing physical activity for 30 minutes per day, 2) Consuming fruits and vegetables; and 3) Checking their health regularly (Riskesdas, 2018) and inviting people to be 'INTELLIGENT' by carrying out routine health checks, getting rid of cigarette smoke and other air pollution, diligent physical activity, healthy diet, adequate rest, and controlling stress (Kompasiana , 2018)

The results of the Artiyaningrum & Azam (2016) study found that factors that influence the incidence of hypertension are age (p = 0.022; OR = 2.956), partner status (p = 0.001; OR = 4.610), salt consumption (p = 0.001; OR = 4.173) , coffee consumption (p = 0.033; OR = 2.528), stress (p = 0.0001; OR = 6.333), and consumption of antihypertensive drugs (p = 0.010; OR = 3.095). Unrelated factors were obesity (p = 0.280; OR = 1.598), alcohol consumption (p = 0.502; OR = 1.579), smoking (p = 0.265; OR = 1.651), and sports activities (p = 0.509; OR = 1.338. ), while research by Bui Van et al. (2018) Prevalence and Risk Factors of Hypertension in Two Communes in the Vietnam Northern Mountainous, 2017 is the highest prevalence of hypertension found in Age, BMI, WHR, physical activity and stress.

Stress is one of the controllable causes of hypertension. Stress is the body's reaction to a certain threat, challenge, demand, or request. The heart and blood vessels are two important elements in providing nutrients and oxygen to various organs of the body. However, the activity of these two elements is also connected to the body's response to stress. When stress occurs, the body releases stress hormones, namely adrenaline, cortisol, and norepinephrine, which cause an increase in heart rate and a stronger contraction of the heart muscle. In addition, the blood vessels that supply blood to the heart widen, increasing the amount of blood pumped. The increase in the amount of blood can also increase blood pressure in a person (Brunner & Suddarth, 2001).

Research Objectives: To determine the effect of stress on the incidence of hypertension

## Method

This research method is analytic observational with case-control (Sastroasmoro, 2011). In addition, a qualitative study was also conducted using the in-depth interview method using questionnaires and stress level assessment using the Hamilton Anxiety Rating Scale (HARS) while the Sphygmomanometer to measure blood pressure. The research pays attention to the ethics of Beneficence and Non-Maleficience, Justice, Respect for Privacy and Confidentiality. The research

locations in the city of Mataram include the Cakranegara Health Center, the Karang Taliwang Health Center, the Tanjung Karang Health Center, and the Ampenan Health Center, while the Surabaya City Health Center includes the Pucang Health Center and the Pacar Keling Health Center. The population in this study were all adult patients who visited and were disabled in the medical records of the Puskesmas in Mataram and in the city of Surabaya as many as 208 respondents. The sample selection technique is a heartbeat purposive sampling (Notoatmodjo, 2010).

## Result

Table 1. Characteristics of Hypertension Respondents in the City of Mataram and Surabaya from 9 September to 9 November 2019

| Variable | Blood pressure | | | | | | | | | | Value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Normal | | Normal High | | Mild Hypertension | | Moderate Hypertension | | Severe Hypertension | | |
| | ∑ | % | ∑ | % | ∑ | % | ∑ | % | ∑ | % | |
| Age (Years) | | | | | | | | | | | |
| Late teens (12-16) | 25 | 12.02 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 0.013 |
| Early adults (17-25) | 27 | 12.98 | 1 | 0.48 | 14 | 6.73 | 0 | 0.00 | 0 | 0.00 | |
| Late adults (36-45) | 30 | 14.42 | 7 | 3.37 | 37 | 17.79 | 5 | 2.40 | 1 | 0.48 | |
| Early elder (46-55) | 19 | 9.13 | 4 | 1.92 | 33 | 15.86 | 5 | 2.40 | 0 | 0.00 | |
| Total | 101 | 48.56 | 12 | 5.77 | 84 | 40.38 | 10 | 4.81 | 1 | 0.48 | |
| Gender | | | | | | | | | | | |
| Male | 35 | 16.83 | 3 | 1.44 | 21 | 10.10 | 4 | 1.92 | 0 | 0.00 | 0.268 |
| Female | 66 | 31.73 | 9 | 4.33 | 63 | 30.29 | 6 | 2.88 | 1 | 0.48 | |
| Total | 101 | 48.56 | 12 | 5.77 | 84 | 40.38 | 10 | 4.81 | 1 | 0.48 | |
| Educational Background | | | | | | | | | | | |
| Basic | 22 | 10.58 | 7 | 1.37 | 58 | 27.88 | 7 | 3.37 | 1 | 0.48 | 0.000 |
| Medium | 52 | 25.00 | 4 | 1.92 | 22 | 10.58 | 1 | 0.48 | 0 | 0.00 | |
| Advance | 27 | 12.98 | 1 | 0.48 | 4 | 1.92 | 2 | 0.96 | 0 | 0.00 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 101 | 48.56 | 12 | 5.77 | 84 | 40.38 | 10 | 4.81 | 1 | 0.48 | |

Table 1 : it shows age (α = 0.013), gender (α = 0.268), education (α = 0.000). The results of this study show that age and education contribute to hypertension, while gender does not contribute to hypertension.

Table 2. Identification of Stress and Blood Pressure Levels in the City of Mataram and Surabaya from 9 September to 9 November 2019

| Variable | Blood Pressure | | | | | | | | | | Value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Normal | | Normal High | | Mild Hypertension | | Moderate Hypertension | | Severe Hypertension | | |
| | ∑ | % | ∑ | % | ∑ | % | ∑ | % | ∑ | % | |
| Stress | | | | | | | | | | | |
| None | 86 | 41.35 | 3 | 1.44 | 10 | 4.81 | 2 | 0.96 | 0 | 0.00 | 0.000 |
| Mild | 14 | 6.73 | 7 | 3.37 | 52 | 25.00 | 7 | 3.37 | 1 | 0.48 | |
| Moderate | 1 | 0.48 | 1 | 0.48 | 14 | 6.73 | 0 | 0.00 | 0 | 0.00 | |
| Severe | 0 | 0.00 | `1 | 0.48 | 8 | 3.85 | 1 | 0.48 | 0 | 0.00 | |
| Total | 101 | 48.56 | 12 | 5.77 | 84 | 40.38 | 10 | 4.81 | 1 | 0.48 | |

Table 2: shows that stress affects the incidence of hypertension. The results of statistical tests can be α = 0.000 <0.05, meaning that there is a correlation between stress and the incidence of hypertension.

## Discussion

1. Age and Blood Pressure

The statistical test results obtained α = 0.013 <0.05, meaning that age has an effect on the increase in respondent blood pressure. Age is related to high blood pressure (hypertension). The older a person is, the greater the risk of developing hypertension (Khomsan, 2003). This occurs because at that age the large arteries lose their flexibility and become stiff because of that the blood at each heart beat is forced to pass through the narrower blood vessels than usual and causes an increase in blood pressure (Sigarlaki, 2006). The results of this study are supported by research conducted by Abdurrachim (2015) which states that respondents who came to Puseksamas and experienced hypertension were above 45 years old. In previous studies, it was also found that the higher the age, the more susceptible to hypertension due to the reduced ability and understanding in absorbing information related to health, this is in accordance with research which states that the risk of hypertension increases with age (Edwards et al., 2000).

2. Gender and Blood Pressure

The statistical test results obtained α = 0.268> 0.05, which means that gender has no effect on increasing blood pressure. In this study, gender had no effect, this was because the incidence of women and men was not different. According to Tabrizi et al. (2016) on average women will experience an increased risk of high blood pressure (hypertension) after

menopause, namely over 45 years of age. Postmenopausal women are protected by the hormone estrogen which plays a role in increasing the levels of High-Density Lipoprotein (HDL). Low HDL cholesterol levels and high LDL cholesterol (Low-Density Lipoprotein) affect the atherosclerosis process (Anggraini et al., 2009). Research conducted by Everett et al. (2015) shows that men have a higher level of hypertension than women but have a lower level of awareness of hypertension than women. However, other research conducted by Wahyuni & Eksanoto (2013) shows that women tend to suffer from hypertension than men. In that study, 27.5% of women had hypertension, while only 58% for men. Women will experience an increased risk of high blood pressure after menopause, namely over 45 years of age. Because women who have not menopause are protected by the hormone estrogen which plays a role in increasing the levels of High-Density Lipoprotein (HDL). Low HDL and high LDL levels will affect the atherosclerosis process and lead to high blood pressure (Anggraini et al., 2009)

3. Education and Blood Pressure

The results of statistical tests obtained $\alpha = 0.000 < 0.05$, meaning that age has an effect on the increase in blood pressure of respondents. Education is an indicator of the level of human ability in understanding access to information obtained from outside, in this case, it is related to health information related to awareness to want to check oneself. and knowing the complications of advanced hypertension, including recognizing early symptoms (Ridawati Sulaeman, et al, 2018). The level of education indirectly affects blood pressure in the elderly because the level of education affects a person's lifestyle, namely smoking, alcohol consumption, food intake, and physical activity (Anggara & Prayitno, 2012).

4. Stress and Blood Pressure

The statistical test results obtained $\alpha = 0.000 < 0.05$, it means that stress correlates with an increase in blood pressure. Stress that occurs in individuals will trigger an increase in blood pressure by a mechanism that triggers an increase in adrenaline levels. Stress will stimulate the sympathetic nerves which will result in increased blood pressure and increased cardiac output. Stress will increase if the resistance of peripheral blood vessels and cardiac output increases, which stimulates the sympathetic nerves. So that stress will react to the body, including increased muscle tension, increased heart rate, and increased blood pressure. This reaction is raised when the body reacts quickly when it is not used, it can lead to diseases including hypertension (Yosep et al., 2014).

A method which states that strong emotional states and intense stress can and will continue for a long time to be a somatic reaction that directly affects the circulatory system which can affect heart rate and circulatory system (Aekplakorn et al., 2005). Physiologically, stress can increase pulse, blood pressure, respiration, and arrhythmias. Apart from the physiological response to the release of the hormone adrenaline as a result of severe stress, blood pressure can rise and blood clots can lead to heart attacks. Adrenaline can also speed up heart rate and constrict coronary arteries (Suparto, 2010). Sugiharto (2007) states that stress is constant and continues for a long time and can increase sympathetic nerves which can lead to increased blood pressure (Yosep et al., 2014). In addition, if the situation is often emotional and negative thinking slowly and without realizing it, physical symptoms such as hypertension will appear. Stress can also result in increased blood flow to the kidneys, skin, and digestive tract and the body will produce more adrenaline hormones which can make the heart more likely. the working system will be stronger and faster (Brunner & Suddarth, 2001).

Stress is a response or reaction to various demands or burdens on it that are non-specific in nature, but besides that stress can also be a trigger factor, a cause as well as a result of a disorder or disease. Psychosocial factors have sufficient meaning for stress in a person. Stress in life is something that cannot be avoided (The cause of stress or called a stressor can change, in line with human development but stress conditions can also occur at any time

throughout life. Sources of stress, namely: from within, within the family, in the community (Kulkayeva et al., 2012) In addition, generally individuals who experience stress, have difficulty sleeping so that it will have an impact on their blood pressure which tends to be high (Sukadiyanto, 2010). Triyanto (2014) states that non-adherence to medication and prolonged stress can exacerbate hypertension.

## Conclusion

Prolonged stress can cause an increase in blood pressure, so it is hoped that individuals can manage stress by keeping themselves busy with positive activities and doing regular physical activity.

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