# Blood Pressure Analysis Based on Nutritional Status and Lifestyle in Employees with Hypertension 

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#### Abstract

The incidence of hypertension continues to increase. Hypertension is related to lifestyle and nutritional status. This study aimed to analyze blood pressure based on the nutritional status and lifestyle of employees with hypertension. An analytic study with a cross-sectional design was conducted from July to September 2022 by recruiting all Hasanuddin University rectorate employees with hypertension. The total number of respondents in this study was 63 people. Data was collected by measuring blood pressure and anthropometry, while lifestyle risk factors were collected using a questionnaire. Pearson correlation was performed to measure the correlation between blood pressure and nutritional status. A t-test and ANOVA were used to measure differences in blood pressure based on lifestyle. This study found a correlation between Body Mass Index and systolic and diastolic blood pressure, and there was no difference in blood pressure, both systole and diastolic, based on smoking behavior, coffee consumption, stress levels, and physical activity patterns in employees with hypertension. Based on these results, it is recommended that people with hypertension improve their nutritional status and lifestyle.


## 1. Introduction

Hypertension is a modifiable risk factor for cardiovascular disease (Tanuseputro et al., 2003). This disease accounts for more than $10 \%$ of causes of death worldwide (Forouzanfar et al., 2017). Previous studies have shown that older age, increased body mass index and waist circumference and family history of cardiovascular disease are significant predictors of hypertension (Parikh et al., 2008; Tapela et al., 2021; Tiruneh et al., 2020). Hypertension is a condition of chronically elevated blood pressure in the blood vessels. This increase in blood pressure can occur because the heart works harder to pump blood to meet the body's needs. If hypertension is allowed to continue, it will damage the heart and kidneys (Badan Penelitian dan Pengembangan Kesehatan, 2013)

Hypertension is not known as the causative factor. Previous studies reported several factors that can influence the occurrence of hypertension, namely smoking, drinking alcoholic beverages, excess weight, and stress (Pradono, 2010; Tapela et al., 2021; Tiruneh et al., 2020). isk factors that cannot be controlled in hypertension include gender, heredity, race, and age. Meanwhile, the risk factors of hypertension that can be controlled are lack of exercise or activity, obesity, drinking coffee, smoking, sodium sensitivity, alcoholism, low potassium levels,
diet, work, education, and stress (Andria, 2013). Stress is thought to affect increasing blood pressure, also known as a factor in hypertension. Stress is a bodily and psychological reaction to environmental demands on a person. The body's reactions to stress include cold sweats, shortness of breath, and heart palpitations. Psychological reactions to stress are frustration, tension, anger, and aggression (Chu et al., 2024).

One of the risk factors for hypertension that is still debated is coffee consumption. Coffee is widely consumed in society. Coffee affects blood pressure due to the presence of polyphenols, potassium, and caffeine in it (Uiterwaal et al., 2007). Polyphenols and potassium are lower blood pressure. Polyphenols inhibit atherogenesis and improve vascular function. Potassium reduces systolic and diastolic blood pressure by inhibiting the release of renin and increasing sodium and water excretion. It triggers a decrease in plasma volume, cardiac output, and peripheral pressure. Caffeine has a competitive antagonistic effect on adenosine receptors. Adenosine is a neuromodulator that affects several functions in the central nervous system. It causes an increase in total peripheral resistance so that blood pressure will increase (Uiterwaal et al., 2007)

Cigarettes contain many harmful chemicals. These harmful substances can enter the bloodstream, damage the endothelial lining of the arteries, and cause atherosclerosis and hypertension (Sauma et al., 2022). Cigarettes, as much as two cigarettes, will increase systolic and diastolic pressure by 10 mmHg . The blood pressure will remain high for up to 30 minutes after quitting smoking. Whereas in heavy smokers, blood pressure will be at high levels throughout the day (Primatesta et al., 2001)

Physical activity is a risk factor for hypertension. Research results in Kosovo show that physical activity is less at risk of 1.98 times suffering from hypertension (Hashani et al., 2014). Lack of physical activity will increase the risk of hypertension. Physical activity is any body movement produced by skeletal muscles that requires energy expenditure. Physical activity reduces the risk of hypertension by reducing vascular resistance and suppressing the activity of the sympathetic nervous system and the renin-angiotensin system (Hegde \& Solomon, 2015). Inactive people tend to have a higher heart rate (An et al., 2019)

Nutritional status is related to blood pressure (Cossio-Bolanõs et al., 2014). Individuals who are overweight and obese tend to have higher blood pressure than normal individuals. Increasing BMI will increase the incidence of hypertension. Studies conducted on hypertension sufferers found that the majority of hypertension sufferers had overweight nutritional status (Musa et al., 2021). Other studies have found that nutritional status is significantly related to the degree of hypertension (Rosmiati et al., 2023).This study aims to see differences in blood pressure based on lifestyle and nutritional status in employees with hypertension.

## 2. Method

This analytic study used a cross-sectional study design. It was conducted at the rectorate office of Hasanuddin University starting from July to September 2022. The population in this study were employees at the Hasanuddin University rectorate office who suffered from hypertension. The sampling technique in this study used the total sampling method, which takes all respondents to the research location. The total number of respondents was 63 employees. This study used a tensimeter to measure blood pressure, a weight scale to measure body weight, a microtome to measure height, and a questionnaire to measure lifestyle risk factors. The correlation between blood pressure and nutritional status was examined using the

Pearson correlation. Meanwhile, to measure differences in blood pressure based on lifestyle, ttests and ANOVA were used. This study had passed an ethical review by the Faculty of Public Health, Hasanuddin University ethics committee, with certificate number 6989/UN4.14.1/TP.01.02/2022.

## 3. Result and Discussion

Most of the respondents in this study were men (74.6\%), aged 40-59 years (60.3\%), graduated from Senior High School (42.9\%), and had more than four family members (73.0\%). Those characteristics of respondents are presented in Table 1.

Table 1. General characteristics of respondents

| Characteristics | $\mathbf{n}$ | $\mathbf{\%}$ |
| :--- | :--- | :--- |
| Gender |  |  |
| Man | 47 | 74.6 |
| Woman | 16 | 25.4 |
| Age |  |  |
| 20-39 years | 23 | 36.5 |
| 40-59 years | 38 | 60.3 |
| 60-69 years | 2 | 3.2 |
| Education |  |  |
| Senior High School | 27 | 42.9 |
| Diploma | 3 | 4.8 |
| Bachelor | 22 | 34.9 |
| Master | 10 | 15.9 |
| Doctor | 1 | 1.6 |
| Number of household members | 17 |  |
| <4 | 46 | 27.0 |
| $>=4$ |  | 73.0 |

Source: Primary Data, 2022

This study found a correlation between Body Mass Index and blood pressure, both systolic ( $p$-value $<0.000$ ) and diastolic ( $p$-value $=0.012$ ). The Body Mass Index had a moderate positive correlation with systolic blood pressure ( $r=0.524$ ) and a weak positive correlation with diastolic blood pressure ( $r=0.313$ ). Meanwhile, the waist circumference has a moderate positive correlation with systolic blood pressure ( $\mathrm{r}=0.458$ ) and has a weak positive correlation with diastolic blood pressure ( $\mathrm{r}=0.345$ ). The Pearson correlation results are shown in Table 2. This finding is similar to a previous study that found an association between increased BMI and systolic blood pressure. The relationship was stronger in men than in women. Individuals who were overweight or obese had higher systolic and diastolic blood pressures than people who had a normal BMI. Reducing BMI is one way to lower blood pressure (Khan et al., 2022). This study also found a correlation between systolic and diastolic blood pressure and abdominal circumference. This study's results align with a study that found an association between blood pressure and abdominal circumference in 10,260 people. In particular, the study found that systolic blood pressure had a positive relationship with visceral fat and lean body (Malden et al., 2019).

Table 2. Correlation between nutritional status and blood pressure

| Nutrition Status | Systole <br> p-value* | r | Diastole <br> p-value* | r |
| :--- | :--- | :--- | :--- | :--- |
| Body Mass Index | 0.000 | 0.524 | 0.012 | 0.313 |
| Waist circumference | 0.000 | 0.458 | 0.000 | 0.345 |
| *Pear |  |  |  |  |

*Pearson correlation test
Source: Primary Data, 2022
Table 3 shows the differences in blood pressure based on employee's lifestyles. This study found that there was no difference in blood pressure, both systole and diastolic, based on smoking behavior, coffee consumption, stress levels, and physical activity patterns in employees with hypertension ( $p$-value > 0.05).

Table 3. Differences in blood pressure based on lifestyle

| Lifestyle | Systole <br> Mean | SD | p-value | Diastole <br> mean | SD | p-value |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Smoker |  |  |  |  |  |  |
| Yes | 148.4 | 8.1 | 0.401 | 88.7 | 6.1 | 0.669 |
| Not | 151.9 | 15.9 |  | 89.9 | 10.6 |  |
| Drinking coffee |  |  |  |  |  |  |
| Yes | 149.5 | 9.9 | 0.346 | 89.2 | 6.9 | 0.707 |
| Not | 153.1 | 18.8 |  | 90.2 | 12.5 |  |
| Stress level |  |  |  |  |  |  |
| Medium | 151.4 | 14.6 | 0.539 | 89.6 | 9.7 | 0.959 |
| High | 145.0 | 7.1 |  | 90.0 | 14.1 |  |
| Physical activity |  |  |  |  |  |  |
| Low | 155.1 | 11.7 | 0.350 | 89.7 | 8.8 | 0.461 |
| Medium | 150.0 | 16.7 |  | 88.2 | 9.4 |  |
| High | 149.0 | 12.7 |  | 91.9 | 10.9 |  |

Source: Primary Data, 2022
This study found no difference in blood pressure based on lifestyle in employees with hypertension. The results of this study differ from several studies that have been conducted, as a study found that there was a relationship between stress levels and the incidence of hypertension in hypertensive employees (Ramdani et al., 2017). There is a significant relationship between stress levels and the degree of hypertension in hypertensive employees at the Andalas Padang Health Center, with a moderate correlation strength. The higher the stress level, the higher the degree of hypertension (Huraini, 2014). Research that analyzed the relationship between stress and hypertension in the elderly at the Elderly Support Center in Manado City found that there was a significant relationship between stress and the incidence of hypertension (Seke et al., 2016).

The increasing burden of employees and busy working hours are some causes of workplace stress. Work stress can trigger obesity, which can increase BMI in workers. Work stress can change unhealthy eating patterns and lack of exercise (Spector, 2002). He results of
research on factors related to the incidence of hypertension found that most of the respondents in the study had high stress and consumed cigarettes. The study found that age and stress factors were the causes of hypertension (Elvira \& Anggraini, 2019).

The habit of drinking coffee increases the risk of hypertension, but it depends on the frequency of daily consumption (Martiani \& Lelyana, 2012). Research that looked at the relationship between coffee drinking habits and hypertension levels found a relationship between coffee drinking habits and hypertension levels, with a value of $r=0.809$, which indicates that the correlation between these factors is robust. The study found that, on average, employees who had a habit of drinking heavy coffee had hypertension (Rahmawati \& Daniyati, 2016). However, an article review showed that of the 16 articles on the relationship between coffee consumption and the incidence of hypertension, five articles found a relationship, and 11 articles did not find a relationship between these variables (Puspita \& Fitriani, 2021). Previous study analyzing the relationship between smoking and coffee consumption and blood pressure in hypertensive employees showed that there was a relationship between smoking and coffee consumption and blood pressure in hypertensive employees at Pembina Palembang Health Center (Firmansyah \& Rustam, 2017). It was in line with research conducted by Ainun that also found a relationship between coffee consumption and the incidence of hypertension in students at Hasanuddin University (Ainun et al., 2012).

There is a relationship between smoking and increased cardiovascular risk; smokers' blood pressure spikes many times throughout the day during the respondent's smoking (Casey \& Benson, 2007). his increase occurs because nicotine constricts blood vessels, forcing the heart to work harder. It increases blood pressure (Casey \& Benson, 2007). Workers need good nutritional status. It is due to the nutritional status affecting other health statuses. As explained, nutritional status is related to blood pressure. Normal nutritional status can reduce blood pressure, thereby reducing the incidence of hypertension. A balanced diet and sufficient physical activity can provide a normal nutritional status. The work environment needs to pay attention to workers' needs for adequate nutritional intake by providing healthy canteens. The work environment is also expected to provide sports facilities so workers can adopt a healthy lifestyle to achieve optimal nutritional status.

A study that analyzed hypertension in the productive age population (15-64 years) showed that exercise was not associated with the incidence of hypertension Exercise helps improve the work and function of vital organs, such as the heart, lungs, and blood vessels. Physical activity will reduce resting pulse rate, lactic acid buildup, and atherosclerosis. In addition, physical activity also increases HDL cholesterol (Franczyk et al., 2023). Employees with hypertension are advised to avoid strenuous physical activity. Differences in hemodynamic and neuroendocrine functions can cause physical activity failure to lower blood pressure in some individuals (Nurrafi'u et al., 2023).

## 4. Conclusion

This study found a correlation between Body Mass Index and systolic and diastolic blood pressure. Meanwhile, there was no difference in blood pressure, both systole and diastolic, based on smoking behavior, coffee consumption, stress levels, and physical activity patterns in employees with hypertension. Based on these results, it is recommended that people with hypertension improve their nutritional status and lifestyle. Improved nutritional status and lifestyle will help lower blood pressure, reducing the risk of degenerative diseases.

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## References

Ainun, A. S., Arsyad, D. S., \& Rismayanti. (2012). Hubungan gaya hidup dengan kejadian hipertensi pada mahasiswa di lingkup kesehatan Universitas Hasanuddin. Fakultas Kesehatan Masyarakat Universitas Hasanuddin.

An, S. J., Jung, M. H., Ihm, S. H., Yang, Y. jung, \& Youn, H. J. (2019). Effect of physical activity on the cardiometabolic profiles of non-obese and obese subjects: Results from the Korea National Health and Nutritional Examination Survey. PLoS ONE, 14(3). https://doi.org/10.1371/journal.pone. 0208189
Sauma, A. W., Sriagustini, I., Fitriani, S., Hidayani, W. R., \& Malabanan, L. M. (2022). The analysis of factors influencing hypertension on elderly: a literature study. Journal of Public Health Sciences, 1(01), 16-29. https://doi.org/10.56741/jphs.v1i01.45
Badan Penelitian dan Pengembangan Kesehatan. (2013). Riset Kesehatan Dasar (Riskesdas) 2013.
Casey, A., \& Benson, H. (2007). Harvard medical school guide to lowering your blood pressure (1st ed.). Mc Graw Hill.

Chu, B., Marwaha, K., Sanvictores, T., Awosika, A. O., \& Ayers, D. (2024, January). Physiology, stress reaction. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK541120/
Cossio-Bolanõs, M., Cossio-Bolanõs, W., Menacho, A. A., Campos, R. G., Silva, Y. M. Da, Abella, C. P., \& De Arruda, M. (2014). Estado nutricional y presión arterial de adolescentes escolares. Archivos Argentinos de Pediatria, 12(4), 302-307. https://doi.org/10.5546/aap.2014.eng. 302

Elvira, M., \& Anggraini, N. (2019). Faktor-faktor yang berhubungan dengan kejadian hipertensi. Jurnal Akademika Baiturrahim, 8(1), 78-89.
Firmansyah, M. R., \& Rustam. (2017). Hubungan merokok dan konsumsi kopi dengan tekanan darah pada pasien hipertensi. Jurnal Kesehatan, 7(2), 263-268.
Forouzanfar, M. H., Liu, P., Roth, G. A., Ng, M., Biryukov, S., Marczak, L., Alexander, L., Estep, K., Abate, K. H., Akinyemiju, T. F., Ali, R., Alvis-Guzman, N., Azzopardi, P., Banerjee, A., Bärnighausen, T., Basu, A., Bekele, T., Bennett, D. A., Biadgilign, S., ... Murray, C. J. L. (2017). Global burden of hypertension and systolic blood pressure of at least 110 to $115 \mathrm{mmHg}, 1990-2015$. JAMA - Journal of the American Medical Association, 317(2), 165-182. https://doi.org/10.1001/jama.2016.19043
Franczyk, B., Gluba-Brzózka, A., Ciałkowska-Rysz, A., Ławiński, J., \& Rysz, J. (2023). The impact of aerobic exercise on HDL quantity and quality: a narrative review. In International Journal of Molecular Sciences (Vol. 24, Issue 5). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/ijms24054653

Hashani, V., Roshi, E., \& Burazeri, G. (2014). Correlates of hypertension among adult men and women in Kosovo. Materia Socio Medica, 26(3), 213. https://doi.org/10.5455/msm.2014.26.213-215

Hegde, S. M., \& Solomon, S. D. (2015). Influence of physical activity on hypertension and cardiac structure and function. In Current Hypertension Reports (Vol. 17, Issue 10). Current Medicine Group LLC 1. https://doi.org/10.1007/s11906-015-0588-3
Huraini, E. (2014). Hubungan tingkat stres dengan derajat hipertensi pada pasien hipertensi di wilayah kerja Puskesmas Andalas Padang tahun 2014. Ners Jurnal Keperawatan, 10(2), 166-175.

Khan, J. R., Biswas, R. K., \& Islam, M. M. (2022). Relationship between blood pressure and BMI in young adult population: a national-level assessment in Bangladesh. British Journal of Nutrition, 128(10), 20752082. https://doi.org/10.1017/S0007114521005134

Nurrafi'u, G. K., Effendi, M. Z. H., Pramesty, C. L., Maharani, S. B., \& Castyana, B. (2023). The role of cycling on hypertense people. Sports Medicine Curiosity Journal, 2(1), 42-51. https://doi.org/10.15294/smcj.v2i1.75214

Malden, D., Lacey, B., Emberson, J., Karpe, F., Allen, N., Bennett, D., \& Lewington, S. (2019). Body fat distribution and systolic blood pressure in 10,000 adults with whole-body imaging: UK biobank and Oxford biobank. Obesity, 27(7), 1200-1206. https://doi.org/10.1002/oby. 22509

Martiani, A., \& Lelyana, R. (2012). Faktor risiko hipertensi ditinjau dari kebiasaan minum kopi (studi kasus di wilayah kerja Puskesmas Ungaran pada bulan Januari-Februari 2012). Journal of Nutrition College, 1(1), 78-85.

Andria, K. M. (2013). Hubungan antara perilaku olahraga, stress dan pola makan dengan tingkat hipertensi pada lanjut usia di posyandu lansia Kelurahan Gebang Putih Kecamatan Sukolilo Kota Surabaya. Jurnal Promkes, 1(2), 111-117.
Musa, E. C., Kesehatan, F., Universitas, M., Ratulangi, S., \& Belakang, A. L. (2021). Status gizi penderita hipertensi di wilayah kerja Puskesmas Kinilow Tomohon. Sam Ratulangi Journal of Public Health, 2(2).
Parikh, N. I., Pencina, M. J., Wang, T. J., Benjamin, E. J., Lanier, K. J., Levy, D., D', R. B., Sr, A., Kannel, W. B., \& Vasan, R. S. (2008). A risk score for predicting near-term incidence of hypertension: The Framingham Heart Study. www.annals.org
Pradono, J. (2010). Faktor-faktor yang mempengaruhi terjadinya hipertensi di daerah perkotaan (Analisis data Riskesdas 2007) (Vol. 33, Issue 1).
Primatesta, P., Falaschetti, E., Gupta, S., Marmot, M. G., \& Poulter, N. R. (2001). Association between smoking and blood pressure evidence from the Health Survey for England Scientific Contributions. http://www.hypertensionaha.org
Puspita, B., \& Fitriani, A. (2021). Peran konsumsi kopi terhadap kejadian hipertensi pada laki-laki usia produktif (18-65 Tahun). Muhammadiyah Journal of Nutrition and Food Science (MJNF), 2(1), 13-23. https://doi.org/10.24853/mjnf.2.1.13-23

Rahmawati, R., \& Daniyati, D. (2016). Hubungan kebiasaan minum kopi terhadap tingkat hipertensi. Journals of Ners Community, 7(2), 149-161.

Ramdani, H. T., Rilla, E. V., \& Yuningsih, W. (2017). Hubungan tingkat stres dengan kejadian hipertensi pada penderita hipertensi. Jurnal Keperawatan 'Aisyiyah, 4(1), 37-45.
Rosmiati, R., Haryana, N., Firmansyah, H., Purba, R., Nurfazriah, L., \& Fransiari, M. (2023, May 10). Nutritional status, blood pressure levels, and the associated risks for hypertension in Islamic High School Teachers in Medan. https://doi.org/10.4108/eai.20-10-2022.2328873

Seke, P. A., Bidjuni, H. J., \& Lolong, J. (2016). Hubungan kejadian stres dengan penyakit hipertensi pada lansia di Balai Penyantunan Lanjut Usia Senjah Ceria Kecamatan Mapanget Kota Manado. E-Journal Keperawatan(e-Kp, 4(2).

Spector, P. E. (2002). Employee control and occupational stress. Current Directions in Psychological Science, 11(4), 133-136.

Tanuseputro, P., Manuel, D. G., Leung, M., Nguyen, K., \& Johansen, H. (2003). Risk factors for cardiovascular disease in Canada. In Can J Cardiol (Vol. 19).

Tapela, N., Collister, J., Clifton, L., Turnbull, I., Rahimi, K., \& Hunter, D. J. (2021). Prevalence and determinants of hypertension control among almost 100000 treated adults in the UK. Open Heart, 8(1). https://doi.org/10.1136/openhrt-2020-001461
Tiruneh, S. A., Bukayaw, Y. A., Yigizaw, S. T., \& Angaw, D. A. (2020). Prevalence of hypertension and its determinants in Ethiopia: A systematic review and meta-analysis. In PLoS ONE (Vol. 15, Issue 12 12). Public Library of Science. https://doi.org/10.1371/journal.pone. 0244642
Uiterwaal, C. S. P. M., Verschuren, W. M. M., Bueno-de-Mesquita, H. B., Ocké, M., Geleijnse, J. M., Boshuizen, H. C., Peeters, P. H. M., Feskens, E. J. M., \& Grobbee, D. E. (2007). Coffee intake and incidence of hypertension. The American Journal of Clinical Nutrition, 85(3), 718-723. https://doi.org/https://doi.org/10.1093/ajcn/85.3.718

