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SURVEY OF SUGAR LEVELS AND BLOOD PRESSURE IN OUTDOOR AND INDOOR WORKERS

Herrywati Tambunan*, Dewi Maritalia, Nuraina
Faculty of Health, Universitas Almuslim, Jalan Almuslim, Matangglumpangdua, Paya Cut, Peusangan, Bireuen, Aceh 24261, Indonesia
*herrywati@umuslim.ac.id

ABSTRACT

Patients with hypertension and diabetes in Indonesia tend to increase every year. Diet and activity patterns are one of the factors causing the disease in addition to heredity. This study aims to determine the level of sugar and blood pressure in workers in open and closed spaces. The sampling technique uses quota sampling, namely 100 respondents who work in open spaces and 100 respondents who work in closed spaces. The instrument used to measure blood pressure is a digital tension meter and to measure blood sugar levels using an easy touch glucometer, both measurements are taken on the same day for each respondent. Data collection was carried out for approximately 3 months, from August to November 2024 in Bireuen Regency. The results of the study were obtained by univariate and bivariate data analysis, univariate results obtained the majority of respondents' age in closed rooms 38-52 years (50%), open spaces 39-53 years (51%). The history of hypertension of respondents in the closed room has no history (78%), open space has no history (68%). There was no history of diabetes in the closed room (68%), no history in the open room (82%), the frequency distribution of respondents' pressure in the closed room (84%) was normal, in the open room (74%) was normal. The results of the examination of blood sugar levels of respondents in the closed room were normal (94%), in the open room normal (77%). The results of bivariate analysis with SPSS through Independent T test for blood pressure of workers in closed and open spaces there is no significant difference with a value of 0.072 (>0.05), and there is a significant difference between blood sugar levels of workers in closed spaces and workers in open spaces with a value of 0.000 (<0.05). Conclusion: the majority of blood pressure and blood sugar levels are within normal limits and there are differences in blood sugar levels between workers in closed spaces and workers in open spaces.

Keywords: blood pressure; diabetes; hypertension; sugar level; survey

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INTRODUCTION

Blood sugar and blood pressure checks are important for the prevention and monitoring of diseases related to high blood pressure (hypertension) and high blood sugar levels (diabetes). Hypertension and diabetes can lead to serious complications such as heart attack, stroke, kidney failure, and other health problems. Indonesia is the country with the fifth largest number of diabetics in the world. According to the International Diabetes Federation (IDF), there are 19.5 million people with diabetes. If not controlled, by 2030 diabetes is expected to reach 30 million people (Mongkau et al., 2022). The prevalence of hypertension in Indonesia is quite high, according to data from the Ministry of Health in 2018 in Indonesia the number of people with hypertension in 2018 was 34.1% (Erika, 2023). Aceh Province in 2022 there were 497,572 people with hypertension who received health services according to standards or 38.29%. while people with diabetes were 189,464 and those who received services amounted to 57.36% (Indonesia, 2022). Bireuen Regency has a coverage of health services for patients with hypertension of 43.71% and diabetes of 69.96% (Dinas Kesehatan Aceh, 2023).

Diabetes mellitus and hypertension are chronic diseases that often occur together. They are interrelated diseases that predispose an individual to cardiovascular disease. Hypertension and diabetes mellitus can have 4-5 times the risk of causing death, stroke and coronary heart disease (Maria, 2021). The most dominant factor in influencing the occurrence of diabetes is physical activity, where someone who lacks physical activity will be 5 times more at risk of developing diabetes (Nasution et al., 2021) (Desi et al., 2018). According to Harahap's research, people with light physical activity have an approximate 3 times risk of developing hypertension compared to those with moderate and heavy physical activity (Harahap et al., 2017) (Makawekes et al., 2020).

The incidence of hypertension and diabetes tends to increase over the past few years, not only suffered by people over 45 years old but also experienced by productive age or under 45 years old. The results of the study prove that there are genetic factors that play a role in the incidence of hypertension and diabetes, but diet, activity patterns and the work environment are also factors that trigger the onset of these diseases. It is possible that in the future more and more productive age people will experience hypertension and diabetes, which will adversely affect work productivity. Working in an open space and in a closed space is certainly different, working in a closed space tends to usually expend less energy than working in an open space. Usually people who work in closed spaces such as office workers, lecturers have low activity levels, while workers in open spaces such as farmers, builders or construction workers have high activity levels so that their calorie needs are different. The balance between calories in and calories out is very influential on the onset of various diseases including hypertension and diabetes. Hypertension and diabetes can cause heart problems, kidney failure, stroke, and other diseases.

Prevention that can be done to reduce the incidence of hypertension and diabetes in productive age is by monitoring blood pressure and blood sugar regularly and controlling nutritional patterns and activity levels in the workplace. Recent lifestyle changes and technological advancements have caused us to become less mobile and less active indoors. This has led to health problems such as obesity, hypertension, and diabetes (Hermawan et al., 2020). Dessy Hermawa's research on the effect of sun exposure on people with diabetes mellitus, the more often a person avoids sun exposure or moves indoors, the more blood glucose levels will increase, increasing the risk of becoming diabetic (Dessy & Nabila Aurelia, 2022). Wahyuni's research on the effect of sun exposure on lowering blood pressure that sun exposure has an effect on lowering high blood pressure in hypertensive patients (Wahyuni & Nurhidayat, 2019). Physical activity of diabetics has a very important role in controlling blood sugar levels, where when doing physical exercise there is an increase in glucose utilization by active muscles so that it can directly cause a decrease in blood glucose (Alza et al., 2020).

It is important for people with diabetes to have their blood glucose checked. Blood glucose level is the amount of sugar or glucose in the blood. A person over the age of 20 has a normal blood sugar level in the range of 100-180 mg/dL per day, and is a dangerous category if it is below 70 mg/dL. Blood sugar levels are influenced by lifestyle, activity and intake of nutrients from food or drinks, especially carbohydrates, as well as the amount of insulin and the sensitivity of body cells to insulin. Blood sugar levels that are too high or too low will have adverse effects on health, both in the short and long term. Although constantly changing, blood sugar levels need to be kept within normal limits to avoid disorders in the body, namely hypoglycemia (low blood sugar) and hyperglycemia (high blood sugar) which results in diabetes mellitus (Trisnadewi et al., 2022). Whereas a blood pressure check is a procedure to measure how strong the blood pressure is in the arteries when the heart is pumped. it is said

that blood pressure is normal if the systole blood pressure is 120-129 mmHg and the diastole blood pressure is 80-89 mmHg. This procedure is generally done with a blood pressure meter, either a pump (manual) or an automatic machine. In addition, blood pressure checks can be done as part of a routine health check or as a screening for high blood pressure (hypertension) (Ardiana, 2022).

Diabetes and hypertension are closely related. One of the macroangiopathic complications of diabetes can occur due to changes in blood sugar levels, high blood sugar will stick to the walls of blood vessels. After that, an oxidation process occurs where the blood sugar reacts with proteins from the blood vessel wall which causes AGEs. Advanced Glycosylated Endproducts (AGEs) are substances formed from excess sugar and proteins that bind together. This damages the inner wall of the blood vessels, and attracts saturated fat or cholesterol to the blood vessel wall, resulting in an inflammatory reaction. White blood cells (lecocytes) and blood clotting cells (platelets) as well as other materials coalesce into a clot of plaque, which makes the walls of blood vessels hard, stiff and eventually a blockage that results in changes in blood pressure called hypertension.

Several studies on diabetes and hypertension related to activity, such as Rina Andriani Harahap's research on the effect of physical activity on the incidence of hypertension with a male research sample aged 18-40 years, the results showed that there was an effect of physical activity on the incidence of hypertension that adult men who had light physical activity had an estimated risk of 3 times the risk of developing hypertension compared to those with moderate and heavy physical activity (Harahap et al., 2017). T. Eltrikanawati's research on the relationship between diet and physical activity patterns on blood sugar levels during type 2 diabetes mellitus patients, the results of her research showed that there was a significant relationship between diet and physical activity patterns on blood sugar levels during type 2 diabetes mellitus patients (Eltrikanawati & Tampubolon, 2020). Based on this background, the researcher aims to determine blood sugar levels and blood pressure in workers in open and closed spaces.

METHOD

This research was conducted in Peusangan District, the research time was approximately 3 months starting from August-November 2024. This research is a Survey research. The population is all workers who are in closed spaces, namely teachers, lecturers, administrative officers and workers who are in open spaces, namely pedicab drivers, motorcycle taxi drivers, gardeners, farmers, market laborers, itinerant traders and other similar jobs. The sampling technique uses quota sampling, namely 100 respondents who work in open spaces (Group A) and 100 respondents who work in closed spaces (Group B). Each Group A and Group B respondent had their blood pressure and blood sugar levels measured on the same day. The results of BP and KGD measurements of Group A and Group B were then compared and statistical tests using SPSS through the Independent T Test to determine whether the difference was significant or not. The instrument used was a questionnaire which included the respondent's biodata, family history of diabetes and hypertension, diet, drinking patterns, activity patterns, rest patterns, history of drug consumption and the type of food-beverage last consumed. Instruments used to measure blood pressure using a digital tension meter and to measure blood sugar levels using an easy touch glucometer. Examination of blood pressure and blood sugar levels was carried out after first obtaining consent from the respondent by signing a statement of willingness to become a respondent, if not willing then not included as a respondent.

RESULT

Research by conducting a survey of sugar levels and blood pressure in workers in open spaces and closed spaces with a total sample of 200 respondents consisting of 100 workers in open spaces and 100 workers in closed spaces obtained the following results:

Table 1.
Characteristics of Respondents Based on Age

Age	f	%
Age of Workers in Confined Spaces		
23-37 years old	42	42
38-52 years old	50	50
53-67 years old	8	8
Total	100	100
Age of Workers in Open Spaces		
24-38 years old	16	16
39-53 years old	51	51
54-69 years old	33	33
Total	100	100

Based on the age table above, it shows that out of 100 workers in closed spaces, the majority of respondents are 38-52 years old with 50 (50%) respondents and the minority are 23-37 years old with 8 (8%) respondents. While the age of workers in open spaces, out of 100 respondents, the majority were aged 39-53 years with 51 (51%) respondents and the minority were aged 24-38 years with 16 (16%) respondents.

Table 2.
Characteristics of Respondents Based on Gender

Gender	f	%
Gender of Workers in Confined Spaces		
Male	40	40
Female	60	60
Gender of Workers in Open Spaces		
Male	44	44
Female	56	56

Based on the gender table above, it shows that out of 100 workers in closed spaces, the majority of respondents are female with 60 (60%) respondents While the gender of workers in open spaces, out of 100 respondents, the majority are female with 56 (56%) respondents.

Table 3.
History of Hypertension

History of Hypertension	f	%
Workers in Confined Spaces		
Father	3	3
Mother	9	9
Father and Mother	10	10
No History of Hypertension	78	78
Workers in Open Spaces		
Father	9	9
Mother	17	22
Father and Mother	6	6
No History of Hypertension	68	68

Based on the hypertension history table above, it shows that out of 100 respondents, the majority of workers in closed spaces do not have a history of hypertension with 78 (78%) respondents and the minority have a history of hypertension from their father with 3 (3%) respondents. While workers in open spaces, out of 100 respondents, the majority also had no history of hypertension with 68 (68%) respondents and the minority had a history of hypertension from their father and mother with a total of 6 (6%) respondents.

Table 4.
History of Diabetes Mellitus

History of Diabetes Mellitus	f	%
Workers in Confined Spaces		
Father	13	13
Mother	9	9
Father and Mother	2	2
No History of Diabetes Mellitus	76	76
Workers in Open Spaces		
Father	3	3
Mother	14	14
Father and Mother	1	1
No History of Diabetes Mellitus	82	82

Based on the diabetes mellitus history table above, it shows that out of 100 respondents, the majority of workers in closed spaces do not have a history of diabetes mellitus with 76 (76%) respondents and the minority have a history of diabetes mellitus from their father and mother with 2 (2%) respondents. While workers in open spaces, out of 100 respondents, the majority also did not have a history of diabetes mellitus with a total of 82 (82%) respondents and the minority had a history of diabetes mellitus from father and mother with a total of 1 (1%) respondent.

Table 5.
Distribution of Blood Pressure Examination Results

Blood Pressure Check Results	f	%
Workers in Confined Spaces		
Hypertension	14	14
Normal	84	84
Workers in Open Spaces		
Hypertension	24	24
Normal	74	74

Based on the table of blood pressure examination results above, it shows that out of 100 respondents, the majority of workers in closed spaces have normal blood pressure, 76 (76%) respondents and the minority have a history of diabetes mellitus from father and mother with a total of 84 (84%) respondents. While the blood pressure of workers in the open room, out of 100 respondents, the majority also had normal blood pressure with a total of 74 (74%).

Table 6.
Distribution of Blood Sugar Level Results

Blood Sugar Level Results	f	%
Workers in Confined Spaces		
Hyperglycemia	6	6
Normal	94	94
Workers in Open Spaces		
Hyperglycemia	23	23
Normal	77	77

Based on the frequency distribution table of examination (Blood Sugar Level) above, it shows that out of 100 respondents, the majority of workers in closed spaces have normal blood sugar levels with 94 (94%) respondents and the minority have high blood sugar levels (hyperglycemia) with 2 (2%) respondents. While workers in open spaces, out of 100 respondents, the majority had normal blood sugar levels with 77 (77%).

Table 7.
T-test of Blood Pressure Examination of Workers in Closed and Open Spaces

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
TD	Equal variances assumed	13.623	.000	1.808	198	.072	.100	.055	-.009	.209
	Equal variances not assumed			1.808	190.033	.072	.100	.055	-.009	.209

Based on the table above, it shows that the results of the T test for blood pressure examination results do not have a significant difference where Sig. (2-tailed) is 0.072 (> 0.05), so that blood pressure in workers in closed spaces has no difference with blood pressure of workers in open spaces.

Table 8.
T-test of Blood Sugar Level Examination of Workers in Closed and Open Space

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KGD	Equal variances assumed	24.545	.000	-4.167	185	.000	-43.344	10.401	-63.864	-22.823
	Equal variances not assumed			-4.348	148.911	.000	-43.344	9.969	-63.043	-23.645

Based on the table above shows that from the results of the T test for blood sugar levels the significance value of Sig. (2-tailed) is 0.000 <0.05, so it can be concluded that there are differences in the results of blood sugar levels in workers in closed spaces and workers in open spaces.

DISCUSSION

Research with a survey of sugar levels and blood pressure in workers in open spaces and closed spaces that have been carried out obtained the majority of blood pressure and blood sugar levels within normal limits, which means that the majority of respondents do not have diabetes mellitus or hypertension. Blood sugar levels are used as a reference in determining diabetes mellitus, while blood pressure is used in determining hypertension. Hypertension and diabetes are degenerative diseases that are still widely suffered by the community, the causes of their occurrence are due to many factors including genetic factors, the environment, activities, age and also lifestyles such as diet, stress, smoking, and also weight. Working in closed and open spaces also affects blood pressure and blood sugar levels. Physical activity will make the body's metabolism work more optimally which results in controlled blood glucose levels and blood pressure. According to the researcher's assumption that normal blood sugar and blood pressure levels in this study could be due to the fact that people have begun to realize the importance of maintaining health and easily get health services such as BPJS services, posyandu and easily find information about health both through health workers and also social media so as to change people's behavior about health. This is in line with (Leonita & Jalinus, 2018) research, that social media contributes positively to health promotion efforts and (Rumengan et al., 2015) research said that there was a significant relationship between

respondents' perceptions of JKN, service access and respondents' perceptions of officer actions with service utilization.

Judging from the results of the study showed that there was no significant difference in blood pressure results from workers in closed and open spaces. Basically, the increase in blood pressure occurs not only because of activity, there are several factors that cause an increase in pressure (hypertension) such as lifestyle, genetic factors and others. Blood pressure can also change throughout the day according to the situation, blood pressure increases in a state of excitement, anxiety, or during activities. According to the researcher's assumption, there is no difference between blood pressure in open and closed spaces because the incidence of hypertension can occur in office workers and field workers (outdoors). Hypertension is one of the health problems that occur in society, one of the factors is due to workload and also economic burden, which makes stress. Stress is an important issue to discuss because almost everyone in their lives experiences stress related to their work. This can be influenced by work demands and economic demands and responsibilities for humans (Sugiarti et al., 2021).

This is in line with the research of Rusnoto & Hermawan, (2018) with a research sample of factory workers, it was found that there was a relationship between work stress and the incidence of hypertension in workers (Rusnoto & Hermawan, 2018). According to research (Najikh & Permatasari, 2023) work stress factors and dietary patterns also affect the increased risk of metabolic disorders in workers which can ultimately lead to increased blood pressure. The results showed that there was a difference in blood sugar levels in workers in closed and open spaces. Physical activity is one of the factors that can increase energy needs (energy expenditure), and has a very important role in regulating blood sugar levels in the body, because when someone does movement or physical activity, the muscles will contract so that they break down sugar, then it will be stored and then will turn into an energy source then needed by the muscles so that they can move again or the muscles will use glucose in the bloodstream for fuel, so the more used the lower the blood sugar levels. According to the researcher's assumption, blood sugar levels are influenced by physical activity, and also by diet. This is in line with the research of Sitorus, C. E., Mayulu, N., & Wantania, J. (2020) which says that there is a positive correlation between fast food consumption, sugary foods/drinks and physical activity on nutritional status, and there is a positive correlation between physical activity and blood sugar levels (Sitorus et al., 2020). The type of work can affect physical activity, someone who has a job is less likely to have light activities such as office workers who only sit in front of a computer, thus making the body experience an increase in blood sugar levels especially not balanced with a healthy diet, as a result it can cause diabetes mellitus.

Measurement of blood pressure and blood glucose is important because it can help detect health problems early and reduce the risk of serious complications because elevated blood pressure and blood sugar levels constitute metabolic syndrome, which is a set of risk factors found to appear together including a combination of elevated blood glucose levels that cause diabetes mellitus, abnormalities in fat profiles, high blood pressure (hypertension), and obesity. The prevalence of metabolic syndrome among current workers also tends to increase (Ayunin et al., 2019). Hypertension and diabetes mellitus if not treated properly, will cause complications of degenerative diseases. Degenerative disease is a disease caused by a decrease in organ function. Some degenerative diseases are hypertension, coronary heart disease, diabetes mellitus, gout, etc. and the causes of the development of degenerative diseases include unhealthy lifestyles such as smoking, stress, lack of physical activity and exercise.

CONCLUSION

Survey research on sugar levels and blood pressure in workers in open and closed spaces can be concluded that the age characteristics of respondents who sampled this study were 38-53 years old, the majority of female gender. Most respondents did not have a history of hypertension and diabetes mellitus. The results of the examination where the frequency distribution of blood pressure and blood sugar levels in both workers in closed spaces and workers in open spaces are both in the normal category. The results of bivariate analysis of blood pressure showed no significant difference in the results of pressure checks between workers in closed and open spaces, and there were differences in the results of blood glucose levels in workers in closed and open spaces. The importance of always maintaining and monitoring blood sugar levels and blood pressure remains normal, because of the risks posed such as the occurrence of degenerative diseases that greatly affect the improvement of public health status.

REFERENCES

Alza, Y., Arsil, Y., Marlina, Y., Novita, L., & Agustin, N. D. (2020). Aktivitas Fisik, Durasi Penyakit Dan Kadar Gula Darah Pada Penderita Diabetes Mellitus (DM) Tipe 2. Jurnal Gizido, 12(1), 18–26.

Ardiana, M. (2022). Buku Ajar Menangani Hipertensi. Airlangga University Press.

Ayunin, U. Q., Retnowati, E., & Prayitno, J. H. (2019). Prevalensi Komponen Sindrom Metabolik Pada Pegawai Bumn PT Wijaya Karya Divisi IV Surabaya. Ghidza: Jurnal Gizi Dan Kesehatan, 3(1), 7–11.

Desi, D., Rini, W. N. E., & Halim, R. (2018). Determinan Diabetes Melitus Tipe 2 Di Kelurahan Talang Bakung Kota Jambi. Jurnal Kesmas Jambi, 2(1), 50–58.

Dessy, H., & Nabila Aurelia, H. (2022). Pengaruh Paparan Sinar Matahari Pada Penderita Diabetes Melitus Tipe 2. Holistik: Jurnal Kesehatan, 16(1), 35–41.

Dinas Kesehatan Aceh. (2023). Profil Kesehatan Aceh 2022. Dinas Kesehatan.

Eltrikanawati, T., & Tampubolon, M. (2020). Hubungan Pola Makan Dan Pola Aktifitas Fisik Terhadap Kadar Gula Darah Pada Pasien Diabetes Mellitus Tipe 2. Jurnal Ilmiah Keperawatan Imelda, 6(2), 171–177.

Erika, E. (2023). Meningkatkan Pemahaman Masyarakat Pentingnya Deteksi Dini Diabetes Melitus Melalui Penyuluhan Dan Pengukuran Gula Dan Tekanan Darah. EJOIN: Jurnal Pengabdian Masyarakat, 1(7), 685–697.

Harahap, R. A., Rochadi, R. K., & Sarumpae, S. (2017). Pengaruh Aktivitas Fisik Terhadap Kejadian Hipertensi Pada Laki-Laki Dewasa Awal (18-40 Tahun) Di Wilayah Puskesmas Bromo Medan Tahun 2017. Jurnal Muara Sains, Teknologi, Kedokteran Dan Ilmu Kesehatan, 1(2), 68–73.

Hermawan, D., Nova Muhani, S. S. T., Nurhalina Sari, S. K. M., Arisandi, S., Lubis, M. Y., Ked, S., Kristiana, T., Ked, S., Umdiyana, L., & Firdaus, A. A. (2020). Mengenal obesitas. Penerbit Andi.

Indonesia, K. R. (2022). Profil Kesehatan Indonesia Tahun 2020 [Internet]. Pusdatin. Jakarta; 2020.

Leonita, E., & Jalinus, N. (2018). Peran Media Sosial Dalam Upaya Promosi Kesehatan: Tinjauan Literatur. Invotek: Jurnal Inovasi Vokasional Dan Teknologi, 18(2), 25–34.

Makawekes, E., Suling, L., & Kallo, V. (2020). Pengaruh aktivitas Fisik Terhadap Tekanan Darah Pada Usia Lanjut 60-74 Tahun. Jurnal Keperawatan, 8(1), 83–90.

Maria, I. (2021). Asuhan Keperawatan Diabetes Mellitus Dan Asuhan Keperawatan Stroke. Deepublish.

Mongkau, L., Langi, F. L. F. G., & Kalesaran, A. F. C. (2022). Studi Ekologi Prevalensi Diabetes Melitus Dengan Stroke Di Indonesia. Prepotif: Jurnal Kesehatan Masyarakat, 6(2), 1156–1162.

Najikh, A. U., & Permatasari, H. (2023). Faktor Risiko Sindrom Metabolik Pada Pekerja: Sistematik Review. Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 15(2), 281–293.

Nasution, F., Andilala, A., & Siregar, A. A. (2021). Faktor Risiko Kejadian Diabetes Mellitus. Jurnal Ilmu Kesehatan, 9(2), 94–102.

Rumengan, D. S. S., Umboh, J. M. L., & Kandou, G. D. (2015). Faktor-Faktor Yang Berhubungan Dengan Pemanfaatan Pelayanan Kesehatan Pada Peserta BPJS Kesehatan di Puskesmas Paniki Bawah Kecamatan Mapanget Kota Manado. Jikmu, 5(2).

Rusnoto, R., & Hermawan, H. (2018). Hubungan Stres Kerja Dengan Kejadian Hipertensi Pada Pekerja Pabrik Di Wilayah Kerja Puskesmas Kaliwungu. Jurnal Ilmu Keperawatan Dan Kebidanan, 9(2), 111–117.

Sitorus, C. E., Mayulu, N., & Wantania, J. (2020). Hubungan Konsumsi Fast Food, Makanan/Minuman Manis dan Aktifitas Fisik Dengan Kadar Gula Darah Dan Status Gizi Mahasiswa Fakultas Kedokteran Universitas Sam Ratulangi. Indonesian Journal of Public Health and Community Medicine, 1(4), 10–17.

Sugiarti, F., Kurniawati, L. M., & Susanti, Y. (2021). Scoping Review: Hubungan Stres Kerja dengan Hipertensi pada Tenaga Kesehatan. Jurnal Integrasi Kesehatan Dan Sains, 3(1), 41–47

Trisnadewi, N. N. W., Januraga, P. P., Ked, S., Pinatih, G. N. I., GK, S., & Duarsa, D. P. (2022). Buku Pedoman Manajemen Diabetes untuk Pasien dan Keluarga.

Wahyuni, S. E., & Nurhidayat, S. (2019). Pengaruh Paparan Sinar Matahari terhadap Penurunan Tekanan Darah pada Pasien Hipertensi. 1st Prosiding Seminar Nasional Fakultas Ilmu Kesehatan, 240–247.