

Predicted Factors Related to Medication Compliance and Blood Pressure in Hypertension Patients

Faktor-faktor yang Diprediksi Berkaitan dengan Kepatuhan Pengobatan dan Tekanan Darah pada Pasien Hipertensi

Faridah Baroroh^{1*}, Imaniar Noor Faridah¹, Andriana Sari¹, Yosi Pratama Dewi²

¹Department of Pharmacology and Clinical Pharmacy, Faculty of Pharmacy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia

²Regional Public Hospital (RSUD) Hasanuddin Damrah, Manna, South Bengkulu, Indonesia
Email: faridah@pharm.uad.ac.id

ABSTRACT

Nonadherence to antihypertensive medication is a key factor contributing to treatment-resistant hypertension. The main goal of hypertension treatment is to reduce morbidity and mortality by effectively lowering blood pressure. This study aimed to identify the factors influencing medication adherence and blood pressure regulation in patients with hypertension. This research utilized a retrospective cohort design. Data were gathered using the MARS questionnaire and patient medical records. The study sample consisted of hypertensive outpatients from five community health centers in the Special Region of Yogyakarta, Indonesia. Data analysis was performed using the Chi-square test. A total of 410 respondents met the inclusion criteria, with the majority being female (75.7%), 67.8% of patients adhered to their medication regimen, while 49.5% had controlled blood pressure. Difficulty remembering to take medication ($p=0.010$) and difficulty taking medication ($p=0.049$) were significantly associated with non-adherence. Age ($p=0.001$) and medication adherence ($p=0.037$) were also significantly associated with blood pressure control. The study's conclusion showed that adherence to taking medication and age are highly correlated to controlled blood pressure in hypertensive patients. Moreover, several factors related to compliance need to be identified to increase patient compliance and therapy outcomes for outpatient hypertension patients at the health center.

Keywords: Indonesia, Outpatients, Adherence, Goals, Health Centers

ABSTRAK

Ketidakpatuhan terhadap pengobatan antihipertensi merupakan faktor kunci yang berkontribusi terhadap resistensi pengobatan hipertensi. Tujuan utama pengobatan hipertensi adalah untuk mengurangi morbiditas dan mortalitas dengan menurunkan tekanan darah secara efektif. Studi ini bertujuan untuk mengidentifikasi faktor-faktor yang memengaruhi kepatuhan pengobatan dan pengaturan tekanan darah pada pasien hipertensi. Penelitian ini menggunakan desain kohort retrospektif. Data dikumpulkan menggunakan kuesioner MARS dan rekam medis pasien. Sampel penelitian terdiri dari pasien rawat jalan hipertensi dari lima puskesmas di Daerah Istimewa Yogyakarta, Indonesia. Analisis data dilakukan menggunakan uji Chi-square. Sebanyak 410 responden memenuhi kriteria inklusi, dengan mayoritas perempuan (75,7%), 67,8% pasien patuh terhadap rejimen pengobatan mereka, sedangkan 49,5% memiliki tekanan darah terkontrol. Kesulitan mengingat untuk minum obat ($p=0,010$) dan kesulitan minum obat ($p=0,049$) secara signifikan berhubungan dengan ketidakpatuhan. Usia ($p=0,001$) dan kepatuhan minum obat ($p=0,037$) juga secara signifikan berhubungan dengan pengendalian tekanan darah. Kesimpulan penelitian menunjukkan bahwa kepatuhan minum obat dan usia sangat berkorelasi dengan pengendalian tekanan darah pada pasien hipertensi. Selain itu, beberapa faktor yang berkaitan dengan kepatuhan perlu diidentifikasi untuk meningkatkan kepatuhan pasien dan hasil terapi bagi pasien hipertensi rawat jalan di pusat kesehatan.

Kata Kunci: Indonesia, Pasien Rawat Jalan, Kepatuhan, Tujuan Pengobatan, Pusat Kesehatan Masyarakat

I. INTRODUCTION

Hypertension, in 2010, ranked as the most prevalent condition among the top ten diseases. It also remains one of the leading causes of death in the Special Region of Yogyakarta. A 2019 survey recorded 10,180 outpatient cases of hypertension in hospitals and clinics (Yogyakarta Health Service, 2020). The prevalence of hypertension continues to rise, with only 30.66% of patients managing to control their blood pressure compared to those untreated (Osei-Yeboah et al., 2021). Effective hypertension management aims to lower both morbidity and mortality associated with the condition through pharmacological and non-

pharmacological interventions. The Eighth Joint National Committee (JNC VIII) suggests that patients younger than 60 years old with uncomplicated hypertension should aim for a blood pressure below 140/90 mmHg, while the target for those aged 60 years and above is less than 150/100 mmHg (James et al., 2014).

A study in India reported that 52.8% of patients adhered to treatment among the 79% who had received prescriptions following positive hypertension screenings (Balsari et al., 2017). Patients adhering to their prescribed regimens were significantly more likely to have their blood pressure well-controlled (OR = 13.82; 95% CI = 5.46–34.95; $p < 0.001$) (Adidja et al.,

2018). On the other hand, non-compliance with antihypertensive therapy is the main reason why hypertension treatment becomes ineffective (Durand et al., 2018). Identifying factors that lead to non-adherence can assist in managing hypertensive patients more effectively (Burnier & Egan, 2019). Successful therapy is influenced by several factors, including regular physical activity, dietary control, and consistent medication use (Athiyah et al., 2019).

When considering reasons for non-adherence in chronic disease patients, factors such as difficulties in taking medication, self-medication practices, desire for more health information, smoking, low physical activity, younger age, and the number of regular medications all play significant roles (Llorca et al., 2021). A Malaysian study revealed that only 13.2% of patients were compliant with their treatment regimen, and these patients were found to be taking fewer medications (5.6 ± 2.2) than non-compliant individuals (9.6 ± 2.1) ($t = -10.2$, $df = 257$, $p < 0.001$). Additionally, gender and age have been shown to have significant correlations with adherence to antihypertensive treatments and lifestyle changes (Adinkrah et al., 2020; Mebrahtu et al., 2021; Pan et al., 2021). Age, in particular, is one of the most important predictors of adherence, age (62%) also emerged as a predictor of high

blood pressure (Li et al., 2019), with older individuals tending to follow medication regimens more consistently ($OR = 1.07$) (Al-Noumani et al., 2018). Studies from Namibia also indicate that education level, employment status, and the presence of other chronic conditions are linked to higher adherence rates (Nagamine et al., 2023).

Meanwhile, in Uganda, family support plays a vital role in encouraging adherence to hypertension medication (Najjuma et al., 2020). Implementing lifestyle changes can significantly improve blood pressure control and may even reduce the need for medication (James et al., 2014). Socioeconomic factors, such as low income, have also been strongly associated with non-adherence ($OR = 2.37$ [$95\%CI: 1.12-4.98$], $p < 0.05$), with financial barriers being a primary cause of non-compliance in 66.7% of patients ($aOR = 2.8$; $CI: 1.1-6.9$, $p = 0.024$) (Oates et al., 2020) (Adidja et al., 2018).

Evaluation of medication adherence should become an integral part of assessment of patients with hypertension (Hamrahian et al., 2022). Given the findings from prior studies, it is evident that various factors influence adherence to hypertension treatment, which in turn affects the success of the therapy. Research into these factors is essential to provide a clearer understanding of the relationship

between adherence and controlled blood pressure, allowing for strategies that improve patient compliance and ultimately lead to better treatment outcomes.

II. METHOD

A. Study design and setting

The research employed an analytical observational method with a retrospective cohort design, and data were gathered from five community health centers in the Special Region of Yogyakarta (DIY). The study was conducted after receiving ethical approval from the Aisyiah University Yogyakarta Ethics Committee, under permit number 1301/KEP-UNISA/IV/2020.

B. Participants and study size

The study included 410 respondents, exceeding the minimum required sample size of 385 for observational studies (Lemeshow et al., 1990). The study sample consisted of hypertensive outpatients from five community health centers in the Special Region of Yogyakarta (DIY). The criteria for the research sample were as follows:

1. Inclusion criteria

- a. Patients aged over 18, diagnosed with hypertension, and currently on antihypertensive medication.
- b. Hypertensive patients with complete data comprehensive records (blood

pressure measurements within the last three months) who regularly visit the community health center for follow-up and treatment.

- c. Patients who consent to participate in this study.

2. Exclusion criteria are pregnant patients.

C. Data collection and instrument

The data were gathered using the Medication Adherence Report Scale (MARS) questionnaire (Chan et al., 2020). Patient adherence was assessed using the MARS questionnaire, which consists of five questions addressing the following aspects: (1) forgetting to take medication, (2) altering the prescribed dosage, (3) discontinuing medication, (4) failing to follow the dosage instructions, and (5) taking medication less frequently than prescribed. The scoring for this questionnaire is as follows: Always = 1, Often = 2, Sometimes = 3, Rarely = 4, Never = 5, with a total score of 25 indicating compliance and a score below 25 indicating non-compliance. Validity testing of the MARS questionnaire demonstrated that the correlation coefficient (r-value) for each item was greater than 0.444. Additionally, the reliability of the MARS questionnaire, assessed using Cronbach's alpha coefficient, yielded a value of 0.741. These results confirm that the questionnaire

provides valid and reliable data (Sari & Cakrawardana, 2019).

D. Variables and statistical analysis

In addition to assessing medication adherence, this study also evaluated treatment outcomes by measuring patients' blood pressure after three months of therapy. The blood pressure results were used to assess the effectiveness of the treatment. Blood pressure is considered controlled if it remains below 140/90 mmHg for patients under 60 years with uncomplicated hypertension, and below 150/100 mmHg for those aged 60 years and older (James et al., 2014).

The study collected three types of data: respondents' demographic characteristics, adherence scores, and blood pressure levels after three months of treatment. The data were categorized into two groups, and a subsequent analysis was performed to examine the relationships. The *Chi-square* test was used to determine the relationship between demographic characteristics, adherence, and blood pressure control.

III. RESULTS AND DISCUSSION

A. Participants and descriptive data

The study, which included 410 respondents meeting the inclusion criteria, revealed that the majority were women

(75.9%), with an equal distribution of adults and older adults. These findings align with a previous study conducted at a primary health clinic in Malaysia, which also examined medication adherence among elderly patients. The study confirmed that female patients were more likely to adhere to their prescribed medication regimen (Choudhury et al., 2023). Detailed demographic characteristics and patient adherence are presented in Table I.

The rate of non-compliance among patients in this study was found to be 32.2%, indicating a higher adherence rate compared to non-compliant patients. This level of adherence surpasses that reported in a study conducted in Medan, Indonesia, where 58% of respondents exhibited poor adherence levels (Hassanein, 2020). Similarly, a study in Congo revealed a non-adherence rate to antihypertensive treatment of 54.2% among 395 hypertensive respondents (Lulebo et al., 2015). A study in Ghana demonstrated that the prevalence of non-adherence to hypertension treatment reached 63.7% (Atibila et al., 2022), while a study in India reported that 26.78% of patients adhered to their hypertension treatment regimen (Singh et al., 2022).

Controlled blood pressure in the study reached 49.5%, which shows that controlled blood pressure achievement was

still less than 50%. Nonetheless, this result is higher than that observed in a study conducted in Northwest Ethiopia, where 42.9% of participants had controlled blood pressure (Teshome et al., 2018). Research in Accra, Ghana, also showed that less than a quarter of hypertensive patients (23.3%) achieved controlled blood pressure (Okai et al., 2020). In a study of adult hypertensive patients at a referral hospital in Northwest Ethiopia, 39.9% achieved controlled blood pressure (Mekonnen et al., 2017).

Table I. Demographic characteristics and medication adherence

Demographic characteristics		n (%)
Gender	Male	99 (24.1)
	Female	311 (75.9)
Age	Adult	205 (50.0)
	Elderly	205 (50.0)
Education	College	49 (12.0)
	Elementary-Senior High School	361 (88.0)
Marital Status	Not married / widower/widow	26 (6.3)
	Married	384 (93.7)
Work	Working	148 (36.1)
	Not working	262 (63.9)
Income	Less than / equal to UMR	365 (89.0)
	More than UMR	45 (11.0)
Compliance	Comply	278 (67.8)
	Not comply	132 (32.2)
Blood pressure	Controlled	203 (49.5)
	Uncontrolled	207 (50.5)

B. Outcome data and main results

This study investigated how demographic characteristics and other factors potentially affecting medication adherence and blood pressure control. The goal was to identify the specific factors associated with adherence and controlled blood pressure in hypertensive outpatients at community health centers. As highlighted in previous research, it is essential to evaluate factors contributing to non-adherence, which can lead to therapeutic failure (Rajpura & Nayak, 2014). The outcomes of this relationship analysis are presented in Table II and Table III.

The results of the analysis in Table II show that difficulty remembering when to take medication and difficulty taking medication are significantly related (p -value < 0.05) to medication adherence in outpatient hypertension patients at the community health center. The results of research in India found that reasons for non-compliance in diabetes mellitus and hypertension patients include difficulty remembering to take daily medication due to work or forgetfulness (Kakumani & Waingankar, 2016) (Kotian et al., 2019). Non-compliance with taking medication in chronic disease patients has difficulty taking medication (Llorca et al., 2021). Difficulty visiting the community health center and lack of medicines at the

community health center were not related to adherence to taking medication. Likewise, in research in Ghana, barriers to access to treatment were not ($p\text{-value} > 0.05$) a factor associated with adherence (Woode et al., 2022).

Meanwhile, gender, age, education, marital status, employment, and income were unrelated to hypertension treatment compliance. Likewise, research in Congo, age, gender, education, and employment (Lulebo et al., 2015); research in Latvia, education level (Gavrilova et al., 2019); research in Afghanistan also shows age, marital status, employment (Stanikzai et al., 2023); research in Memphis, Tennessee, USA also showed that gender and marital

status were not significantly related ($p\text{-value} > 0.05$) with non-adherence to hypertension treatment (Al-Ruthia et al., 2017).

The results of the relationship analysis in Table III show that age and compliance are significantly related ($p\text{-value} < 0.05$) with controlled blood pressure; gender, education, marital status, employment, and income are not associated ($p\text{-value} > 0.05$) with pressure-controlled blood. As in research in Accra, Ghana, education, marital status, knowledge, and income were not related ($p\text{-value} > 0.05$) to controlled blood pressure (Okai et al., 2020).

Table II. Factors predicted to be associated with adherence

Predictors		Adherence		<i>P</i> <i>Value</i>	OR (CI 95%)
		Yes (n%)	No (n%)		
Gender	Male	64(64.6)	35(35.4)	0.516	0.829 (0.515-1.335)
	Female	214(68.8)	97(31.2)		
Age	Adult	132(64.4)	73(35.6)	0.169	0.731 (0.482-1.108)
	Elderly	146(71.2)	59(28.8)		
Education	College	31(63.3)	18(36.7)	0.574	0.795 (0.427-1.480)
	Elementary-High School	247(68.4)	114(31.6)		
Marital status	Not married	20(76.9)	6(23.1)	0.417	1.628 (0.638-4.154)
	Married	258(67.2)	126(32.8)		
Work	Working	96(64.9)	52(35.1)	0.397	0.811 (0.529-1.245)
	Not working	182(69.5)	80(30.5)		
Income	< UMR	253(69.3)	112(30.7)	0.090	1.807 (0.964-3.389)
	$\geq$ UMR	25(55.6)	20(4.4)		
Family support	Yes	276(67.8)	131(32.2)	1.000	1.053 (0.095-11.722)
	No	2(66.7)	1(33.3)		
Difficulty visiting the health center	Yes	14(66.7)	7(33.3)	1.000	0.947 (0.373-2.405)
	No	264(67.9)	125(32.1)		
	Yes	14(58.3)	10(41.7)	0.425	0.647

Predictors		Adherence		P Value	OR (CI 95%)
		Yes (n%)	No (n%)		
Drug shortages at the community health center	No	264(68.4)	122(31.6)	0.127	(0.279-1.498)
Difficulty understanding information from pharmacists	Yes	29(80.6)	7(19.4)		2.080
Believe that the medication received is useful.	No	249(66.6)	125(33.4)	0.230	(0.886-4.880)
Difficulty remembering when to take medication	Yes	120(71.4)	48(28.6)	0.010*	1.329
Undesirable effects due to taking medication	No	158(65.3)	84(34.7)		(0.867-2.036)
Difficulty taking medication	Yes	20(48.8)	21(51.2)	0.835	0.410
Tired of taking medication	No	258(69.9)	111(30.1)		(0.214-0.786)
	Yes	20(64.5)	11(35.5)	0.049*	0.853
	No	258(68.1)	121(31.9)		(0.396-1.836)
	Yes	15(50.0)	15(50.0)	0.701	0.445
	No	263(69.2)	117(30.8)		(0.211-0.940)
	Yes	57(70.4)	24(29.6)	0.701	1.150
	No	221(67.4)	107(32.6)		(0.677-1.953)

Note : *significant

Table III. Factors predicted to be associated with hypertension treatment outcome

Predictors		Outcome		P Value	OR (CI 95%)
		Controlled BP (n%)	Uncontrolled BP (n%)		
Gender	Male	48(48.5)	51(51.5)	0.905	0.947
	Female	155(49.8)	156(50.2)		(0.602-1.489)
Age	Adult	77(37.6)	128(62.4)	0.001*	0.377
	Elderly	126(61.5)	79(38.5)		(0.253-0.562)
Education	College	26(53.1)	23(46.9)	0.706	1.175
	Elementary-Senior High School	177(49.0)	184(51.0)		(0.646-2.137)
Marital status	Not married	16(61.5)	10(38.5)	0.287	1.686
	Married	187(48.7)	197(51.3)		(0.746-3.808)
Work	Working	70(47.3)	78(52.7)	0.568	0.870
	Not working	133(50.8)	129(49.2)		(0.581-1.303)
Income	< UMR	181(49.6)	184(50.4)	1.000	1.028
	>= UMR	22(48.9)	23(51.1)		(0.554-1.911)
Family support	Yes	201(49.4)	206(50.6)	0.986	0.488
	No	2(66.7)	1(33.3)		(0.044-5.423)
Difficulty visiting the health center	Yes	10(47.6)	11(52.4)	1.000	0.923
	No	193(49.6)	196(50.4)		(0.383-2.224)
Drug shortages at the	Yes	13(54.2)	11(45.8)	0.795	1.219
	No	190(49.2)	196(50.8)		(0.533-2.789)

Predictors		Outcome		P Value	OR (CI 95%)
		Controlled BP (n%)	Uncontrolled BP (n%)		
community health center					
Difficulty understanding information from pharmacies	Yes	21(58.3)	15(41.7)	0.350	1.477 (0.739-2.953)
	No	182(48.7)	192(51.3)		
Believe that the medication received is useful.	Yes	89(53.0)	79(47.0)	0.285	1.265 (0.853-1.876)
	No	114(47.1)	128(52.9)		
Difficulty remembering when to take medication	Yes	20(48.8)	21(51.2)	1.000	0.968 (0.508-1.846)
	No	183(49.6)	186(50.4)		
Undesirable effects due to taking medication	Yes	18(58.1)	13(41.9)	0.422	1.452 (0.692-3.047)
	No	185(48.8)	194(51.2)		
Difficulty taking medication	Yes	13(43.3)	17(56.7)	0.608	0.765 (0.361-1.618)
	No	190(50.0)	190(50.0)		
Tired of taking medication	Yes	40(49.4)	41(50.6)	1.000	1.000 (0.615-1.626)
	No	162(49.4)	166(50.6)		
Compliance	Comply	148(53.2)	130(46.8)	0.037*	1.594 (1.049-2.422)
	Not comply	55(41.7)	77(58.3)		

Note : BP = blood pressure; *significant

Adherence to taking medication is significantly related (p -value < 0.05) to controlled blood pressure in outpatient hypertension patients at the health center. The results of the study in Xinxiang also showed medication adherence as a controlling factor for blood pressure ($p < 0.05$; OR:1.54; 95%CI:1.22-1.89) (Zhang et al., 2017). Additionally, research in China revealed a strong correlation between adherence to antihypertensive medication and systolic blood pressure control ($p = 0.001$), though the correlation with diastolic blood pressure control was

weaker ($p = 0.334$) (Yue et al., 2015). In Ethiopia, non-adherence to antihypertensive medication is a factor associated with uncontrolled blood pressure (Solomon et al., 2023). In addition to adherence for hypertension treatment outcomes to be achieved, there must be dietary arrangements. When following the DASH (Dietary Approaches to Stop Hypertension) eating plan, it is important to choose foods that are: (1)Low in saturated and trans fats (2)Rich in potassium, calcium, magnesium, fiber, and protein (3)Lower in sodium (Challa et al., 2025).

In this study we also found that the percentage of patients who have controlled blood pressure were higher in not married and does not have family support group (>60%). The similar result showed in previous study in Korea, the logistic regression analysis showed that hypertension was significantly worse in the group with a spouse compared to the group without a spouse (OD: 0.504, 95% CI: 0.281—0.905), and the group with 1 person in the household than the group with 3 or more persons in the household (OD: 0.553, 95% CI: 0.312—0.982) (Kwon & Ahn, 2018).

Hypertension as chronic disease have many contributed factors related to adherence. Role of health care providers including pharmacists could help patients in achieving their target of treatment. Pharmacists' intervention known can decrease the the number of patients care issues (Mozu et al., 2021). From this study, it is known that the causes of patient non-compliance include difficulty remembering the time to take medication, thus the causes of non-compliance of hypertensive patients can be used as counseling material, where pharmacists can make arrangements for taking medication that is convenient and easy for patients to remember and do. Education with counseling about knowledge, trust, motivation, and family support is effective in increasing

compliance (Prihanti et al., 2020). Many interventions that could be contribute in achieving target of hypertensive management such as disease education, counselling to the patient, also monitoring blood pressure and adherence of the treatment regularly (Soubra & Elba, 2023).

C. Limitation

The limitation of this study is related the reason or factors related to non-compliance. Because this study is only using a questionnaire, the reason of non compliance cannot be explained in details. It needs further research (ie qualitative study) to get specific information regarding the reasons for non compliance.

IV. CONCLUSION

The conclusion of the study shows that difficulty in remembering when to take medication and difficulty taking medication are significantly related to medication adherence in hypertensive patients (p-value < 0.05). Adherence to taking medication and age are known associated with controlled blood pressure in outpatient hypertensive patients at community health centers (p-value < 0.05). Thus, other several factors related to compliance need to be identified to increase patient compliance and therapy outcomes for outpatient hypertension patients at the health center.

CONFLICT OF INTEREST

The author declares that they have no conflict of interest.

ACKNOWLEDGEMENT

We acknowledge the willingness of five community health centers in the Special Region of Yogyakarta (DIY) to help and contribute to this study.

REFERENCES

- Adidja, N. M., Agbor, V. N., Aminde, J. A., Ngwasiri, C. A., Ngu, K. B., & Aminde, L. N. (2018). Non-adherence to antihypertensive pharmacotherapy in Buea, Cameroon: A cross-sectional community-based study. *BMC Cardiovascular Disorders*, 18(1), 150. <https://doi.org/10.1186/s12872-018-0888-z>
- Adinkrah, E., Bazargan, M., Wisseh, C., & Assari, S. (2020). Adherence to Hypertension Medications and Lifestyle Recommendations among Underserved African American Middle-Aged and Older Adults. *International Journal of Environmental Research and Public Health*, 17(18), 6538. <https://doi.org/10.3390/ijerph17186538>
- Al-Noumani, H., Wu, J.-R., Barksdale, D., Knafl, G., AlKhasawneh, E., & Sherwood, G. (2018). Health Beliefs and Medication Adherence in Omanis With Hypertension. *Journal of Cardiovascular Nursing*, 33(6), 518–526. <https://doi.org/10.1097/JCN.0000000000000511>
- Al-Ruthia, Y. S., Hong, S. H., Graff, C., Kocak, M., Solomon, D., & Nolly, R. (2017). Examining the relationship between antihypertensive medication satisfaction and adherence in older patients. *Research in Social and Administrative Pharmacy*, 13(3), 602–613. <https://doi.org/10.1016/j.sapharm.2016.06.013>
- Athiyah, U., Rahem, A., & Setiawan, C. D. (2019). The Influence of Participation of the Social Security Agency (BPJS) Health on Therapeutic Success in Hypertension Patients at Community Health Centers. *Research Journal of Pharmacy and Technology*, 12(1), 93. <https://doi.org/10.5958/0974-360X.2019.00018.0>
- Atibila, F., Donkoh, E. T., Ruiter, R., Kok, G., & Hoor, G. T. (2022). Predictors of Nonadherence to Medications among Hypertensive Patients in Ghana: An Application of the Health Belief Model. *International Journal of Hypertension*, 2022, 1–9. <https://doi.org/10.1155/2022/1418149>
- Balsari, S., Vemulapalli, P., Gofine, M., Oswal, K., Merchant, R., Saunik, S., Greenough, G., & Khanna, T. (2017). A retrospective analysis of hypertension screening at a mass gathering in India: Implications for non-communicable disease control strategies. *Journal of Human Hypertension*, 31(11), 750–753. <https://doi.org/10.1038/jhh.2017.54>
- Burnier, M., & Egan, B. M. (2019). Adherence in Hypertension: A Review of Prevalence, Risk Factors, Impact, and Management. *Circulation Research*, 124(7), 1124–1140. <https://doi.org/10.1161/CIRCRESA.118.313220>
- Challa, H. J., Ameer, M. A., & Uppaluri, K. R. (2025). DASH Diet To Stop Hypertension. In *StatPearls*. StatPearls Publishing. <http://www.ncbi.nlm.nih.gov/books/NBK482514/>
- Chan, A. H. Y., Horne, R., Hankins, M., & Chisari, C. (2020). The Medication

- Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. *British Journal of Clinical Pharmacology*, 86(7), 1281–1288. <https://doi.org/10.1111/bcp.14193>
- Choudhury, P., Gnanasan, S., Sheikh Ghadzi, S. M., & Poddar, S. (2023). Evaluation of Geriatric Medication Adherence using the General Medication Adherence Scale in a Primary Care Setting. *Research Journal of Pharmacy and Technology*, 4172–4178. <https://doi.org/10.52711/0974-360X.2023.00683>
- Durand, H., Hayes, P., Harhen, B., Conneely, A., Finn, D. P., Casey, M., Murphy, A. W., & Molloy, G. J. (2018). Medication adherence for resistant hypertension: Assessing theoretical predictors of adherence using direct and indirect adherence measures. *British Journal of Health Psychology*, 23(4), 949–966. <https://doi.org/10.1111/bjhp.12332>
- Gavrilova, A., Bandere, D., Rutkovska, I., Šmits, D., Mauriņa, B., Poplavska, E., & Urtāne, I. (2019). Knowledge about Disease, Medication Therapy, and Related Medication Adherence Levels among Patients with Hypertension. *Medicina*, 55(11), 715. <https://doi.org/10.3390/medicina55110715>
- Hamrahian, S. M., Maarouf, O. H., & Fülöp, T. (2022). A Critical Review of Medication Adherence in Hypertension: Barriers and Facilitators Clinicians Should Consider. *Patient Preference and Adherence*, Volume 16, 2749–2757. <https://doi.org/10.2147/PPA.S368784>
- Hassanein, M. (2020). Adherence to antihypertensive fixed-dose combination among Egyptian patients presenting with essential hypertension. *The Egyptian Heart Journal*, 72(1), 10. <https://doi.org/10.1186/s43044-020-00044-6>
- James, P. A., Oparil, S., Carter, B. L., Cushman, W. C., Dennison-Himmelfarb, C., Handler, J., Lackland, D. T., LeFevre, M. L., MacKenzie, T. D., Ogedegbe, O., Smith, S. C., Svetkey, L. P., Taler, S. J., Townsend, R. R., Wright, J. T., Narva, A. S., & Ortiz, E. (2014). 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). *JAMA*, 311(5), 507. <https://doi.org/10.1001/jama.2013.284427>
- Kakumani, K. V., & Waingankar, P. (2016). Assessment of compliance to treatment of diabetes and hypertension amongst previously diagnosed patients from rural community of Raigad district of Maharashtra. *J Assoc Physicians India*, 64(12), 36–40. <https://pubmed.ncbi.nlm.nih.gov/28405986/>
- Kotian, S. P., Waingankar, P., & Mahadik, V. J. (2019). Assessment of compliance to treatment of hypertension and diabetes among previously diagnosed patients in urban slums of Belapur, Navi Mumbai, India. *Indian Journal of Public Health*, 63(4), 348–352. https://doi.org/10.4103/ijph.IJPH_422_18
- Kwon, M.-J., & Ahn, S.-Y. (2018). Factors affecting Blood Pressure Control in Elderly Koreans with Hypertension. *Research Journal of Pharmacy and Technology*, 11(4), 1398. <https://doi.org/10.5958/0974-360X.2018.00261.5>
- Lemeshow, S., David W, H. J., Klar, J., & Stephen K, L. (1990). *Adequacy of Sample Size in Health Studies*. World Health Organization.

- Li, Y., Jasani, F., Su, D., Zhang, D., Shi, L., Yi, S. S., & Pagán, J. A. (2019). Decoding Nonadherence to Hypertensive Medication in New York City: A Population Segmentation Approach. *Journal of Primary Care & Community Health*, 10, 215013271982931. <https://doi.org/10.1177/2150132719829311>
- Llorca, C. V. Y., Cortés Castell, E., Ribera Casado, J. M., De Lucas Ramos, P., Casteig Ayestarán, J. L., Casteig Blanco, A., Gil Guillén, V. F., & Rizo Baeza, M. (2021). Factors Associated with Non-Adherence to Drugs in Patients with Chronic Diseases Who Go to Pharmacies in Spain. *International Journal of Environmental Research and Public Health*, 18(8), 4308. <https://doi.org/10.3390/ijerph18084308>
- Lulebo, A. M., Mutombo, P. B., Mapatano, M. A., Mafuta, E. M., Kayembe, P. K., Ntumba, L. T., Mayindu, A. N., & Coppieters, Y. (2015). Predictors of non-adherence to antihypertensive medication in Kinshasa, Democratic Republic of Congo: A cross-sectional study. *BMC Research Notes*, 8(1), 526. <https://doi.org/10.1186/s13104-015-1519-8>
- Mebrahtu, G., M Moleki, M., Okoth Achila, O., Seyoum, Y., Adgoy, E. T., & Ovberedjo, M. (2021). Antihypertensive Medication Adherence and Associated Factors: A Cross-Sectional Analysis of Patients Attending a National Referral Hospital in Asmara, Eritrea. *Patient Preference and Adherence*, Volume 15, 2619–2632. <https://doi.org/10.2147/PPA.S319987>
- Mekonnen, H. S., Gebrie, M. H., Eyasu, K. H., & Gelagay, A. A. (2017). Drug adherence for antihypertensive medications and its determinants among adult hypertensive patients attending in chronic clinics of referral hospitals in Northwest Ethiopia. *BMC Pharmacology and Toxicology*, 18(1), 27. <https://doi.org/10.1186/s40360-017-0134-9>
- Mozu, I. E., Marfo, A. F. A., OPARE-Addo, M., Buabeng, K. O., & Owusu-Daaku, F. T. (2021). Exploring the role of pharmacists in improving blood pressure control among hypertensive patients at the workplace. *Scientific African*, 14, e00983. <https://doi.org/10.1016/j.sciaf.2021.e00983>
- Nagamine, Y., Shobugawa, Y., Sasaki, Y., Takagi, D., Fujiwara, T., Khin, Y. P., Nozaki, I., Shirakura, Y., Kay Thi, L., Poe Ei, Z., Thae, Z., & Win, H. H. (2023). Associations between socioeconomic status and adherence to hypertension treatment among older adults in urban and rural areas in Myanmar: A cross-sectional study using baseline data from the JAGES in Myanmar prospective cohort study. *BMJ Open*, 13(1), e065370. <https://doi.org/10.1136/bmjopen-2022-065370>
- Najjuma, J. N., Brennaman, L., Nabirye, R. C., Ssedyabane, F., Maling, S., Bajunirwe, F., & Muhindo, R. (2020). Adherence to Antihypertensive Medication: An Interview Analysis of Southwest Ugandan Patients' Perspectives. *Annals of Global Health*, 86(1), 58. <https://doi.org/10.5334/aogh.2904>
- Oates, G. R., Juarez, L. D., Hansen, B., Kiefe, C. I., & Shikany, J. M. (2020). Social Risk Factors for Medication Nonadherence: Findings from the CARDIA Study. *American Journal of Health Behavior*, 44(2), 232–243. <https://doi.org/10.5993/AJHB.44.2.10>
- Okai, D. E., Manu, A., Amoah, E. M., Laar, A., Akamah, J., & Torpey, K. (2020). Patient-level factors influencing

- hypertension control in adults in Accra, Ghana. *BMC Cardiovascular Disorders*, 20(1), 123. <https://doi.org/10.1186/s12872-020-01370-y>
- Osei-Yeboah, J., Owusu-Dabo, E., Owiredo, W. K. B. A., Lokpo, S. Y., Agode, F. D., & Johnson, B. B. (2021). Community burden of hypertension and treatment patterns: An in-depth age predictor analysis: (The Rural Community Risk of Non-Communicable Disease Study - Nyive Phase I). *PLOS ONE*, 16(8), e0252284. <https://doi.org/10.1371/journal.pone.0252284>
- Pan, J., Hu, B., Wu, L., & Li, Y. (2021). The Effect of Social Support on Treatment Adherence in Hypertension in China. *Patient Preference and Adherence*, Volume 15, 1953–1961. <https://doi.org/10.2147/PPA.S325793>
- Prihanti, G. S., Sari, N. P., Septiani, N. I., Tobing, L. P. R. L., Adrian, A. R., Ayu, N. R., Abidin, M. Z., & Farid, H. P. (2020). The Effect Of Counseling On The Adherence Of Therapeutic Hypertension Patients. *Jurnal Keperawatan*, 11(2), 110–120. <https://doi.org/10.22219/jk.v11i2.11943>
- Rajpura, J., & Nayak, R. (2014). Medication Adherence in a Sample of Elderly Suffering from Hypertension: Evaluating the Influence of Illness Perceptions, Treatment Beliefs, and Illness Burden. *Journal of Managed Care Pharmacy*, 20(1), 58–65. <https://doi.org/10.18553/jmcp.2014.20.1.58>
- Sari, A., & Cakrawardana, M. A. (2019). The Compliance of Hypertensive Patients in Health Center Pengasih I Kulon Progo. Proceedings of the 2019 Ahmad Dahlan International Conference Series on Pharmacy and Health Science (ADICS-PHS 2019). <https://doi.org/10.2991/adics-phs-19.2019.27>
- Singh, M., Yadav, K., Goswami, S., Parashar, M., Gupta, E., Verma, M., Goel, S., & Malhotra, S. (2022). Predictors of adherence to prescribed antihypertensive medications among Hypertensive (15-49 years) in India: A secondary data analysis of National Family Health Survey 4. *Journal of Family Medicine and Primary Care*, 11(9), 5807. https://doi.org/10.4103/jfmpe.jfmpe_164_22
- Solomon, M., Negussie, Y. M., Bekele, N. T., Getahun, M. S., & Gurara, A. M. (2023). Uncontrolled blood pressure and associated factors in adult hypertensive patients undergoing follow-up at public health facility ambulatory clinics in Bishoftu town, Ethiopia: A multi-center study. *BMC Cardiovascular Disorders*, 23(1), 258. <https://doi.org/10.1186/s12872-023-03290-z>
- Soubra, L., & Elba, G. (2023). Pharmacist Role in Hypertension Management in the Community Setting: Questionnaire Development, Validation, and Application. *Patient Preference and Adherence*, 17, 351–367. <https://doi.org/10.2147/PPA.S394855>
- Stanikzai, M. H., Wafa, M. H., Tawfiq, E., Jafari, M., Le, C. N., Wasiq, A. W., Rahimi, B. A., Baray, A. H., Ageru, T. A., & Suwanbamrung, C. (2023). Predictors of non-adherence to antihypertensive medications: A cross-sectional study from a regional hospital in Afghanistan. *PLOS ONE*, 18(12), e0295246. <https://doi.org/10.1371/journal.pone.0295246>
- Teshome, D. F., Demssie, A. F., & Zeleke, B. M. (2018). Determinants of blood pressure control amongst hypertensive patients in Northwest

- Ethiopia. *PLOS ONE*, 13(5), e0196535.
<https://doi.org/10.1371/journal.pone.0196535>
- Woode, E., Boakye-Gyasi, E., Obirikorang, Y., Adu, E. A., Obirikorang, C., Acheampong, E., & Odame-Anto, E. (2022). Predictors of medication nonadherence among hypertensive clients in a Ghanaian population: Application of the Hill-Bone and Perceived Barriers to Treatment Compliance Scale. *Health Science Reports*, 5(3), e584.
<https://doi.org/10.1002/hsr2.584>
- Yogyakarta Health Service. (2020). *Profil Kesehatan Daerah Istimewa Yogyakarta Tahun 2019*. Dinas Kesehatan Daerah Istimewa Yogyakarta.
<https://kesehatan.jogjakota.go.id/upl>oads/dokumen/profil_dinkes_2020_data_2019.pdf
- Yue, Z., Bin, W., Weilin, Q., & Aifang, Y. (2015). Effect of medication adherence on blood pressure control and risk factors for antihypertensive medication adherence. *Journal of Evaluation in Clinical Practice*, 21(1), 166–172.
<https://doi.org/10.1111/jep.12268>
- Zhang, H., Sun, J., Zhang, H., Zhu, Y., Mao, X., Ai, F., Tang, S., & Li, R. (2017). Correlation between compliance in patients with anti-hypertensive therapy and blood pressure control. *Pakistan Journal of Pharmaceutical Sciences*, 30 (4(Suppl.)), 1455–1460.
<https://pubmed.ncbi.nlm.nih.gov/29043997/>