Indonesian Journal of Pharmacy

VOL 35 (1) 2024: 185–193 | RESEARCH ARTICLE

Predicting the Intention to Adhere to Hypertensive Medication among Seniors: A Cross-Sectional Survey

Niken Nur Widyakusuma[1,2], Sri Suryawati[2], Probosuseno[2] and Chairun Wiedyaningsih[1*]

1. Faculty of Pharmacy, Universitas Gadjah Mada, Sekip Utara Yogyakarta 55281, Indonesia
2. Faculty of Medicine, Public Health, and Nursing, Jl. Farmako Sekip Utara, Yogyakarta55281, Indonesia

Article Info

Submitted: 18-10-2023
Revised: 05-01-2024
Accepted: 15-01-2024

* Corresponding author
Chairun Wiedyaningsih

Email:
chairun_wied@ugm.ac.id

ABSTRACT

Nonadherence to hypertension medication is a widespread problem, especially among senior citizens. Several approaches are needed to improve adherence and include identifying and prioritizing problems related to adherence. A formative study employing theory of planned behavior (TPB) has revealed some salient beliefs underlying the intention to adhere to hypertension medication among seniors. The correlation of these beliefs with adherence needs to be further investigated to identify which belief to be prioritized in a medication adherence strategy. This study aims to identify which belief had the strongest correlation with the intention to adhere to hypertension medication among seniors. A cross-sectional survey was conducted among seniors with hypertension in Yogyakarta. A questionnaire based on TPB was developed and used in this study. The questionnaire was distributed conveniently to three senior communities (offline) and through a Google Form link to five WhatsApp groups (online) in September–December 2023. Data were analyzed by using multiple linear regression analyses. A total of 49 and 48 seniors completed the offline and online questionnaires, respectively. The mean age of the participants was 66.9 ± 4.4 years. Subjective norms and perceived behavioral control, but not attitude, accounted significantly ($p < 0.01$) for 57.6% of the variance in adherence intention. Among beliefs, perceived behavioral control had the strongest correlation with intention, and frequent awareness of blood pressure level had the highest correlation with perceived behavioral control. Understanding which belief has the highest correlation with the intent to adhere to hypertension medication provides insight for developing strategies for improving adherence among seniors.

Keywords: beliefs, hypertension, medication adherence, seniors, theory of planned behavior

INTRODUCTION

Hypertension is the highest risk factor for death and disability in Indonesia (International Health Metrics Monitoring and Evaluation, 2019; Murray *et al*., 2020). The key to managing hypertension and preventing morbidity and mortality due to hypertension is to maintain blood pressure on target. Such a target is achieved through medication adherence (Cross AJ & George, 2020; MacLaughlin & Saseen, 2020). However, given that hypertension is often asymptomatic, nonadherence to hypertension treatment is common. Several studies have shown that nearly 50% of patients with hypertension have low adherence (Abegaz *et al*., 2017; Mahmood *et al*., 2021). Nonadherence is higher in senior groups than in other age groups and ranges from 55.9% to 62.7% of the studied cases (Hamza *et al*., 2019; Lo *et al*., 2016).

Education on hypertension is an important intervention in the management of hypertension. Educational interventions can be provided one-on-one, in groups, alone, or in combination with other interventions (Ukoha-Kalu *et al*., 2023). They can be presented verbally, in printed form, or electronically (Ampofo *et al*., 2020). They can also be given in the form of reminder systems using text messages, voice calls (Arshed *et al*., 2023), and mobile applications for self-assisted educational intervention (Liu *et al*., 2020). The contents of

educational material usually include the definition, detection, complication, risk factors, prevention and treatment of hypertension (Indonesian Society of Hypertension, 2023), dietary changes, physical activity promotion, and stress management (Chang *et al*., 2023). However, the quality of evidence supporting the improvement in medication adherence with educational interventions is low to moderate (Ampofo *et al*., 2020) and show only moderate effects on blood pressure control (Tam *et al*., 2020).

Numerous factors underlie nonadherence among seniors. They range from sociodemographic (age, race, gender, and education), medical (comorbidities and polypharmacy), psychological and behavioral (beliefs about and satisfaction with treatment), and economic (insurance type) (Al-Ruthia *et al*., 2017). Previous research has shown that beliefs about hypertension medication adherence among seniors include (1) those that medicines have adverse effects on the kidney and drugs will no longer be effective if consumed for a long time; (2) those that doctors, family, and neighbors, especially those with experience with herbal/alternative medicine, are not supportive of medication adherence; and (3) those about inhibiting factors, such as physical and cognitive decline, irregular meal times, tablets that must be cut before being taken, insurance that does not cover all drugs, changes in drug regimens, and drug packaging that is difficult to open (Widyakusuma *et al*., 2023). Theory of planned behavior (TPB) states that these beliefs produce attitudes, subjective norms, and perceived behavioral control (Ajzen, 2019) that are the predictors of intention to adhere to hypertension medication.

Designing an intervention that modifies the most powerful predictor, i.e., the specific beliefs that have the greatest influence on intention, would be effective and efficient to increase intention, which in turn improve behavior. While all salient beliefs from previous studies may be used as the target of an educational intervention strategy, the prioritization of the belief that is the most powerful predictor of the intention to adhere to medication needs to be further investigated. Therefore, this study aims to identify which belief has the greatest correlation with the intention to adhere to hypertension medication among seniors.

MATERIALS AND METHODS

A cross-sectional survey was conducted among seniors with hypertension in Yogyakarta. A questionnaire based on TPB was developed and used in this study.

Instrument and its development

A questionnaire for determining the correlation of each belief with intention was constructed by following the TPB manual (Francis *et al*., 2004) with some modifications to facilitate administration to seniors. The questionnaire contained 24 questions and consisted of direct attitude, direct subjective norm, direct perceived behavior, indirect behavioral belief, indirect normative belief, indirect control belief, and total intention domains. On the basis of a previous study (Widyakusuma *et al*., 2023) and observations in the senior community, some salient beliefs were selected as indirect domains. The questionnaire was then tested for validity (corrected item–total correlation) and reliability (Cronbach's α), revised, and tested again for validity and reliability, as explained in the Supplementary Data. The first draft of the questionnaire was tested on 30 visitors of two community pharmacies in Sleman, Yogyakarta, during the first and second weeks of September 2023. After revision, the questionnaire was tested again on 15 online and 15 offline participants at the same community pharmacies during the third week of September 2023. All the participants in this validity and reliability test were chosen conveniently. After the items were verified to be valid and reliable, the final questionnaire was used as the research instrument.

The final questionnaire has two versions: offline and online. The offline version was a paper-based, researcher-assisted, or researcher-administered questionnaire. This questionnaire was written in Bahasa and Javanese with the help of two native speakers and printed in large font (Calibri 16). The online version was provided as a link to a Google Form to facilitate online sharing. Completing each version of the questionnaire took approximately 5–10 min.

Data collection and participants

The final questionnaire was distributed conveniently to three senior communities (offline) and five WhatsApp groups (online) during the last week of September 2023 until December 2023. Offline participants were recruited from three locations: Posyandu Lansia (an integrated health-service post for the elderly) in Kotagede Yogyakarta, Yastroki (Indonesian Stroke Foundation) in Yogyakarta, and Apotek UGM Yogyakarta (a pharmacy retail owned by a university).

Table I. Participant Characteristics

Characteristics		Total (N = 97)	Type of participants		
			Online (N = 48)	Offline (N = 49)	p-value
Age (years old)		66.9 ± 4.4	66.6 ± 3.9	67.2 ± 4.9	0.503
	60–69	72 (74.2)	37 (77.1)	35 (71.4)	0.644
	70–79	25 (25.8)	11 (22.9)	14 (28.6)	
Gender	Female	50 (51.5)	21 (43.7)	29 (59.2)	0.157
	Male	47 (48.5)	27 (56.3)	20 (40.8)	
Education*	Low–middle	46 (47.4)	11 (22.9)	35 (71.4)	0.000
	High	51 (52.6)	37 (77.1)	14 (28.6)	
Years of hypertension*		8.3 ± 8.6	10.9±9.9	5.7±6.3	0.002

Note: Data are presented as mean ± SD or number (%). "Low–middle education" refers to participants who attended elementary, junior, or high school or did not attend school. "High education" refers to participants who have a diploma or bachelor's, master's, or doctorate degree. *$p < 0.01$.

Online participants were invited from five WhatsApp groups: Pams Nordic Walk Community (a group of 80 seniors), the researcher's family members (a group of 53 people), SMP 2 Putri Muhammadiyah alumni '74 (a group of 75 seniors), STM Perindustrian alumni (a group of 50 seniors), and the researcher's neighbors in Kotagede, Yogyakarta (a group of 29 people).

The inclusion criteria were seniors (≥60 years of age) and diagnosed with hypertension or used antihypertensive medicine before data collection. The exclusion criteria were incomplete answers (for the offline questionnaire) and living outside Yogyakarta (for the online questionnaire). A minimum of 80 participants were needed (Francis *et al*., 2004).

Data analysis

This study, including its method of analysis, followed the manual for constructing a questionnaire on the basis of TPB (Francis *et al*., 2004). Eight direct questions applied a five-point Likert scale, and 16 indirect questions used a five-point Likert scale or a bipolar scale (−2 to 2). Direct domains were calculated by adding up each question score and calculating the mean value. Indirect domains were calculated by multiplying the scores of each correlated question, namely, questions that used a Likert scale with the results of the questions on a bipolar scale (behavioral beliefs × outcome evaluations, normative beliefs × motivation to comply, and control beliefs × influence of control beliefs). Multiple linear regression was performed by using SPSS 26 software to analyze correlations between direct domains and total intention (simultaneously), between each direct domain and total intention (individually), and between each indirect domain and its corresponding direct domain. This method of analysis has also been conducted in different studies to predict the intention of physicians to prescribe extemporaneous compounded dosage forms (Wiedyaningsih *et al*., 2016).

Research ethics

This research was approved by the Ethics Committee of the Faculty of Medicine, Public Health, and Nursing Universitas Gadjah Mada with the registration number KE/FK/1299/EC/2021 on December 2, 2021, and extended with the registration number KE/FK/1533/EC/2022 on December 2, 2022.

RESULTS AND DISCUSSION

In total, 97 participants completed the online (n = 48) and offline (n = 49) questionnaires. The number of online participants shows that many seniors can use technology (Table I). However, in general, the online participants are slightly younger, tended to be male, have higher education, and have had hypertension for longer than the offline participants. These characteristic differences are unsurprising because seniors who access the Internet and are familiar with smartphones are usually younger, more affluent, and highly educated than those who do not (Smith, 2014).

The variables of the TPB model significantly explained 57.6% of the variance (R^2) in this study (subjective norm, $\beta = 0.291$, $p < 0.01$ and perceived behavioral control, $\beta=0.494$, $p<0.01$ but not attitude, $\beta = 0.095$, $p = 0.293$).

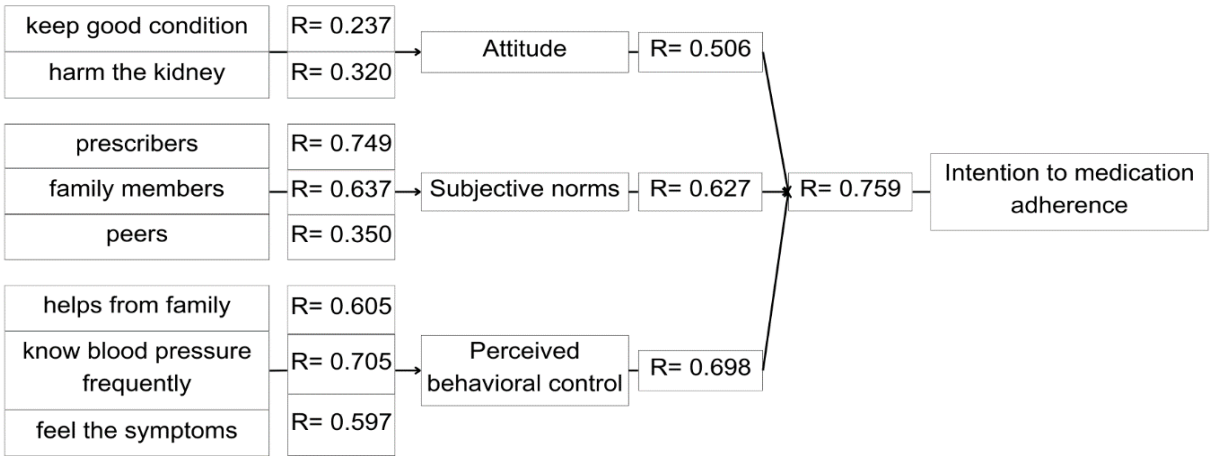

Figure 1. Correlation of beliefs with the intent to adhere to hypertension medication among seniors (N = 97).

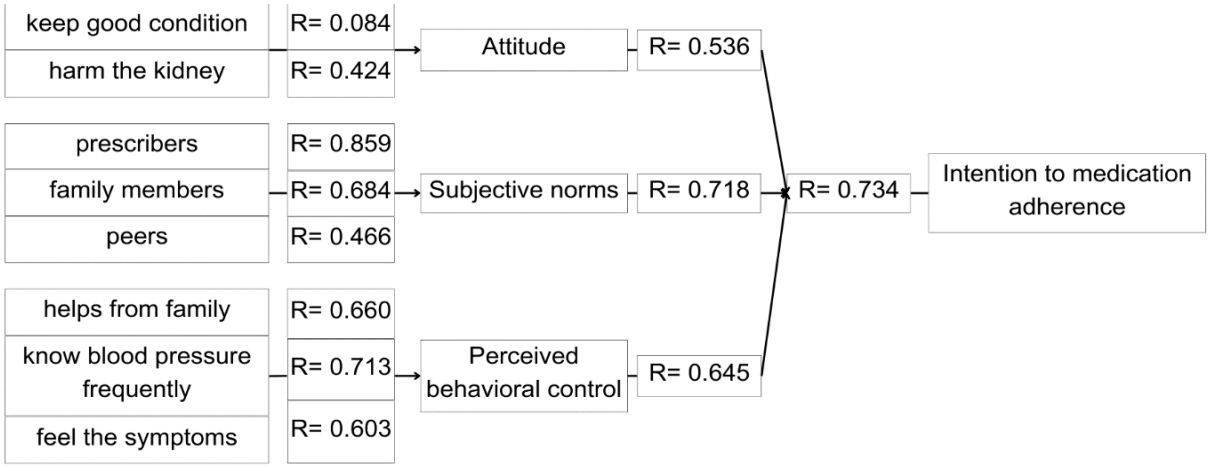

Figure 2. Subgroup analysis of the correlation of beliefs with intention among online participants (N = 48).

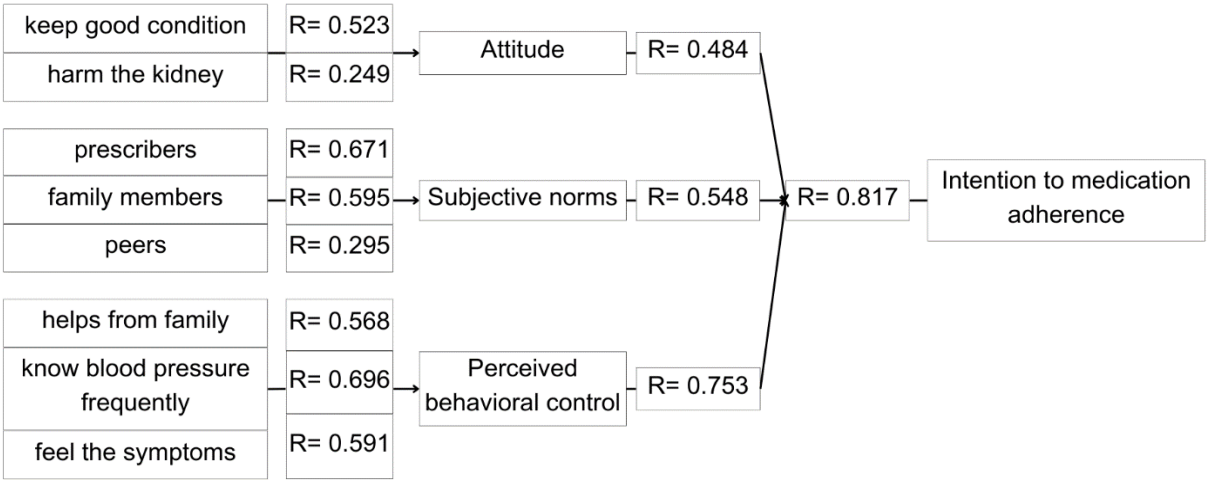

Figure 3. Subgroup analysis of the correlation of beliefs with intention among offline participants (N = 49).

The simultaneous correlation coefficient (R) of the three predictors of intention, individual correlation of each predictor with intention, and correlation of each belief with the corresponding predictor (attitude, subjective norms, and perceived behavioral control) (Figure 1). The analysis showed that the strongest predictor of the intent to adhere to medication is perceived behavioral control (R = 0.698). The belief that most facilitates perceived behavioral control is frequent awareness of blood pressure level (R = 0.705), followed by the availability of help from family (R = 0.605) and whether the participant experiences hypertension symptoms or not (R = 0.597).

Significant differences in education and years of hypertension between online and offline participants were observed. Subgroup analysis was conducted between the online and offline groups to determine the effect of these differences. In the online group (Figure 2), subjective norms served as the strongest predictor of the intention of adherence (R = 0.718), whereas in the offline group (Figure 3), perceived behavioral control served as the strongest predictor of the intention of adherence (R = 0.753). In the online group, subjective norms, but not attitude and perceived behavioral control (R^2 = 0.539; subjective norm, β = 0.563, p < 0.01; attitude, β = 0.164, p = 0.228; perceived behavioral control, β = 0.073, p = 0.710), explained the variance in intention significantly. In the offline group, perceived behavioral control, but not attitude and subjective norms (R^2 = 0.667; perceived behavioral control, β = 0.635, p < 0.01; attitude, β = 0.115, p = 0.379; subjective norm, β = 0.244, p = 0.069), explained the variance in intention significantly.

TPB has been widely used to explain and predict health-related behaviors, such as physical activity intention and behavior in school-aged children (Foley *et al*., 2008) and oral health behavior in adults (Rajeh, 2022). TPB can also be utilized to predict the decision of physicians to prescribe extemporaneous compounds in Indonesia (Wiedyaningsih *et al*., 2016). Moreover, TPB has frequently been applied to predict medication adherence in patients with hypertension, coronary heart disease, and schizophrenia or medication adherence in general (Ho & Lee, 2014; Javaran *et al*., 2020; Kopelowicz *et al*., 2015; Suh, 2021).

However, the strongest predictors of intention to adhere varied in each study. Even in this work, the results show discrepancies between subgroups. This inconsistency may be due to differences in educational level and hypertension duration. Consistent with those of other studies that predicted intent to adhere to hypertension medication, the aggregate results of this study show that the best predictor is perceived behavioral control (Ho & Lee, 2014; Javaran *et al*., 2020). Our finding that perceived behavioral control is the strongest predictor confirms that high self-efficacy is associated with good medication adherence (Rajeh, 2022). However, the results of other studies revealed that the best predictor of intention is subjective norms (Kopelowicz *et al*., 2015) or attitude and subjective norms (He *et al*., 2022). Another study also found that attitudes and perceived behavioral control significantly predicted the intention of hypertension medication adherence, whereas subjective norms did not reach significance in predicting intentions (Bane *et al*., 2006).

This inconsistency may be due to variations in the nature of the disease, treatment, and sociodemographic characteristics among the study subjects. For example, a study by Kopelowicz included patients with schizophrenia aged 18–50 years. Given the central role of family in Mexican-American culture, subjective norms would be the single best predictor of medication adherence (Kopelowicz *et al*., 2015). Meanwhile, our study included participants who were older than those included in other works.

TPB acknowledges the role of background factors. While TPB explains that a person's intention to engage in a behavior can be estimated from attitude, subjective norms, and perceived behavioral control, background factors are believed to have an indirect effect on intentions and behavior by affecting behavioral, normative, and/or control beliefs. These background factors include personality traits, intelligence, demographic characteristics, life values, and other such variables (Ajzen, 2020).

Moreover, the differences in the determinants that predict antihypertensive medication adherence are determined by the theory or construct used. TPB is not the only health psychology theory used to predict adherence to medications (Holmes *et al*., 2014). The health belief model and theory of reasoned action prevail among other theories. Some variables in the health belief model differ from those in TPB. The variables include perceived susceptibility; cues to action; self-efficacy; and perceived barriers (Yue *et al*., 2015), high susceptibility, severity, and benefit (Kamran *et al*., 2014) and were significantly

associated with antihypertensive medication adherence (Yue *et al*., 2015). However, a meta-analysis has confirmed the effectiveness of TPB-based interventions (Steinmetz *et al*., 2016), so this study used TPB constructs.

The results of this study affect the practice of pharmacists in the way they communicate with seniors. Providing new information to improve seniors' behavioral beliefs alone may be ineffective in improving medication adherence among seniors given that the behavioral beliefs that constitute attitude are not important predictors of adherence intention. Optimizing the role of social support systems for seniors may work well to improve control and normative beliefs. However, this situation does not mean that pharmacists should avoid patient education. A study conducted at an integrated health-service post for the elderly in a rural village in Yogyakarta showed that a considerable percentage of participants still had poor hypertension knowledge (Nazihah & Rahmawati, 2022). Therefore, patient education must always be provided while improving effective two-way communication between pharmacists and senior patients with their family or other social supports.

Providing new information will not immediately change the behavioral, normative, and control beliefs that seniors already possess. Efforts can be made to provide new information such that seniors have new beliefs without necessarily changing their existing beliefs. For example, although the belief that hypertension medication is harmful for the kidney may not disappear, patients can be introduced to the new belief that the benefits of adhering to a medication regimen will be greater than the risks to the kidney. Discussions and deliberations can also play a critical role in changing normative beliefs and lifting pluralistic ignorance (Bicchieri & Mercier, 2014). For example, during pharmacist–patient interactions, senior patients and their families may be invited to ignore peers who encourage switching medications to alternative medicines without the supervision of health professionals. Pharmacists may encourage family, health cadres in the community, and other available social support systems to provide frequent access to blood pressure measurements and thus improve control beliefs. Integrated health-service posts for the elderly (Posyandu-Lansia) in Indonesia usually provide routine blood pressure measurement for hypertension screening. Thus, Posyandu-Lansia should be optimized by improving the participation of seniors, emphasizing the role of health cadres, simplifying the care pathway, and facilitating access to hypertension treatment (Gibran & Rahmawati, 2020; Rahmawati & Bajorek, 2015).

The strength of this study lies in its participant selection method. Given that its participants were recruited from senior communities (not bound to any health facility), those who participated may be nonadherent to medication and can present various beliefs. However, it also has limitations in terms of the difference in educational level and years of hypertension between the offline and online participants. Half of the participants were online participants with significantly higher education and longer experience of hypertension than offline participants. This discrepancy might introduce selection bias to the results.

CONCLUSION

This study supports the notion that perceived behavioral control has the highest correlation with the intention of medication adherence among hypertensive seniors. Understanding control beliefs that constitute perceived behavioral control provides insight for developing strategies to improve adherence among seniors.

ACKNOWLEDGMENTS

The authors thank Apotek UGM, Apotek Medikatama, Yastroki, and Posyandu Lansia Kotagede as the study sites; Isni Wulandari and Mahbub Abdul Ghoni for their help in assisting participants in filling the questionnaire; and all study participants.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

Abegaz, T. M., Shehab, A., Gebreyohannes, E. A., Bhagavathula, A. S., & Elnour, A. A. (2017). Nonadherence to antihypertensive drugs: a systematic review and meta-analysis. *Medicine*, *96*(4), e5641. https://doi.org/10.1097/MD.0000000000005641

Ajzen, I. (2019). *Constructing a Theory of Planned Behavior questionnaire*. https://people.umass.edu/aizen/pdf/tpb.measurement.pdf. Accessed February 18, 2024.

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human Behavior*

and Emerging Technologies, *2*(4), 314–324. https://doi.org/https://doi.org/10.1002/hbe2.195

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/https://doi.org/10.1016/j.sapharm.2016.06.013

Ampofo, A. G., Khan, E., & Ibitoye, M. B. (2020). Understanding the role of educational interventions on medication adherence in hypertension: A systematic review and meta-analysis. *Heart & Lung*, *49*(5), 537–547. https://doi.org/https://doi.org/10.1016/j.hrtlng.2020.02.039

Arshed, M., Mahmud, A. B., Minhat, H. S., Ying, L. P., & Umer, M. F. (2023). Effectiveness of mHealth interventions in medication adherence among patients with cardiovascular diseases: a systematic review. *Diseases (Basel, Switzerland)*, *11*(1). https://doi.org/10.3390/diseases11010041

Bane, C., Hughe, C. M., & McElnay, J. C. (2006). Determinants of medication adherence in hypertensive patients: an application of self-efficacy and the theory of planned behaviour. *International Journal of Pharmacy Practice*, *14*(3), 197–204. https://doi.org/10.1211/ijpp.14.3.0006

Bicchieri, C., & Mercier, H. (2014). Norms and beliefs: how change occurs. In M. Xenitidou & B. Edmonds (Eds.), *The complexity of social norms* (pp. 37–54). Springer International Publishing. https://doi.org/10.1007/978-3-319-05308-0_3

Chang, S.-H., Chang, Y.-Y., Jeng, W.-J., & Wai, J. P. M. (2023). Efficacy of a multidimensional self-management intervention on low-education women with metabolic syndrome: a cluster randomized controlled trial. *Scientific Reports*, *13*(1), 10358. https://doi.org/10.1038/s41598-023-36971-y

Cross AJ, E. R. A. P. K. K. L., & George, J. (2020). Interventions for improving medication-taking ability and adherence in older adults prescribed multiple medications. *Cochrane Database of Systematic Reviews*, *5*. https://doi.org/10.1002/14651858.CD012419.pub2

Foley, L., Prapavessis, H., Maddison, R., Burke, S., McGowan, E., & Gillanders, L. (2008). Predicting physical activity intention and behavior in school-age children. *Pediatric Exercise Science*, *20*(3), 342–356.

Francis, J., Eccles, M. P., Johnston, M., Walker, A. E., Grimshaw, J. M., Foy, R., Kaner, E. F. S., Smith, L., & Bonetti, D. (2004). *Constructing questionnaires based on the theory of planned behaviour: A manual for health services researchers* (pp.10-30). Newcastle upon Tyne, UK: Centre for Health Services Research, University of Newcastle upon Tyne.

Gibran, D. M., & Rahmawati, R. (2020). Factors affecting the effectiveness of screening for hypertension in rural community. *Comprehensive Approaches in Hypertension Management*, 119.

Hamza, S. A., El Akkad, R. M., Abdelrahman, E. E., & Abd Elghany, S. A. (2019). Non adherence to antihypertensive medications among hypertensive elderly patients in outpatient geriatric clinic. *The Egyptian Journal of Geriatrics and Gerontology*, *6*(1), 1–7.

He, Q.-H., Zheng, J., Liu, J.-L., Wang, J., & You, L.-M. (2022). Predictors of medication adherence of patients with coronary heart disease after percutaneous coronary intervention: a structural equation modeling based on the extended theory of planned behavior. *Journal of Cardiovascular Nursing*, *37*(4).

Ho, C. P., & Lee, T. J. F. (2014). An evaluation of medication adherence in hypertensive patients using the theory of planned behavior. *Value in Health*, *17*(7), A763. https://doi.org/10.1016/j.jval.2014.08.270

Holmes, E. A. F., Hughes, D. A., & Morrison, V. L. (2014). Predicting adherence to medications using health psychology theories: a systematic review of 20 years of empirical research. *Value in Health*, *17*(8), 863–876. https://doi.org/https://doi.org/10.1016/j.jval.2014.08.2671

Indonesian Society of Hypertension. (2023). *Panduan Promotif & Preventif Hipertensi 2023* (pp. 35-36). Perhimpunan Dokter Hipertensi Indonesia.

International Health Metrics Monitoring and Evaluation. (2019). *Indonesia Profile*. Seattle, WA; IHME, University of Washington. http://www.healthdata.org/INDONESIA. Accessed January 19, 2024.

Javaran, E., Sharifi, H., Hasani, M., Borhaninejad, V., & Iranpour, A. (2020). Effectiveness of a theory of planned behavior-based

intervention for promoting medication adherence among rural elderly hypertensive patients in Iran. *Elderly Health Journal*, *6*. https://doi.org/10.18502/ehj.v6i1.3410

Kamran, A., Sadeghieh Ahari, S., Biria, M., Malepour, A., & Heydari, H. (2014). Determinants of patient's adherence to hypertension medications: application of health belief model among rural patients. *Annals of Medical and Health Sciences Research*, *4*(6), 922–927. https://doi.org/10.4103/2141-9248.144914

Kopelowicz, A., Zarate, R., Wallace, C. J., Liberman, R. P., Lopez, S. R., & Mintz, J. (2015). Using the theory of planned behavior to improve treatment adherence in Mexican Americans with schizophrenia. *Journal of Consulting and Clinical Psychology*, *83*(5), 985–993. https://doi.org/10.1037/a0039346

Liu, K., Xie, Z., & Or, C. K. (2020). Effectiveness of mobile app-assisted self-care interventions for improving patient outcomes in type 2 diabetes and/or hypertension: systematic review and meta-analysis of randomized controlled trials. *JMIR MHealth and UHealth*, *8*(8), e15779. https://doi.org/10.2196/15779

Lo, S. H. S., Chau, J. P. C., Woo, J., Thompson, D. R., & Choi, K. C. (2016). Adherence to antihypertensive medication in older adults with hypertension. *The Journal of Cardiovascular Nursing*, *31*(4), 296–303. https://doi.org/10.1097/JCN.0000000000000251

MacLaughlin, E. J., & Saseen, J. J. (2020). Hypertension. In J. T. DiPiro, G. C. Yee, S. T. Haines, T. D. Nolin, V. L. Ellingrod, & L. M. Posey (Eds.), *DiPiro's Pharmacotherapy: A Pathophysiologic Approach, 11th Edition* (pp.273-274). McGraw Hill.

Mahmood, S., Jalal, Z., Hadi, M. A., Khan, T. M., Haque, M. S., & Shah, K. U. (2021). Prevalence of non-adherence to antihypertensive medication in Asia: a systematic review and meta-analysis. *International Journal of Clinical Pharmacy*, *43*(3), 486–501. https://doi.org/10.1007/s11096-021-01236-z

Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., Abdollahpour, I., Abegaz, K. H., Abolhassani, H., Aboyans, V., Abreu, L. G., Abrigo, M. R. M., Abualhasan, A., Abu-Raddad, L. J., Abushouk, A. I., Adabi, M., … Lim, S. S. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10258), 1223–1249. https://doi.org/10.1016/S0140-6736(20)30752-2

Nazihah, N. Z., & Rahmawati, R. (2022). Knowledge about hypertension and its treatment among patients and lay health workers in the posyandu lansia. *3rd International Conference on Cardiovascular Diseases (ICCvD 2021)*, 215–229.

Rahmawati, R., & Bajorek, B. (2015). A community health worker-based program for elderly people with hypertension in Indonesia: a qualitative study, 2013. *Preventing Chronic Disease*, *12*, E175. https://doi.org/10.5888/pcd12.140530

Rajeh, M. T. (2022). Modeling the theory of planned behavior to predict adults' intentions to improve oral health behaviors. *BMC Public Health*, *22*(1), 1391. https://doi.org/10.1186/s12889-022-13796-4

Smith, A. (2014). *Older adults and technology use*. Pew Research Center. https://www.pewresearch.org/internet/2014/04/03/older-adults-and-technology-use. Accessed February 18, 2024.

Steinmetz, H., Knappstein, M., Ajzen, I., Schmidt, P., & Kabst, R. (2016). How effective are behavior change interventions based on the theory of planned behavior?: a three-level meta-analysis. *Zeitschrift Für Psychologie*, *224*, 216–233. https://doi.org/10.1027/2151-2604/a000255

Suh, K. H. (2021). Verification of a theory of planned behavior model of medication adherence in Korean adults: focused on moderating effects of optimistic or present bias. *BMC Public Health*, *21*(1), 1391. https://doi.org/10.1186/s12889-021-11460-x

Tam, H. L., Wong, E. M. L., & Cheung, K. (2020). Effectiveness of educational interventions on adherence to lifestyle modifications among hypertensive patients: an integrative review. *International Journal of Environmental Research and Public Health*, *17*(7). https://doi.org/10.3390/ijerph17072513

Ukoha-Kalu, B. O., Isah, A., Biambo, A. A., Samaila, A., Abubakar, M. M., Kalu, U. A., & Soyiri, I. N.

(2023). Effectiveness of educational interventions on hypertensive patients' self-management behaviours: an umbrella review protocol. *BMJ Open*, *13*(8), e073682. https://doi.org/10.1136/bmjopen-2023-073682

Widyakusuma, N. N., Suryawati, S., Wiedyaningsih, C., & Probosuseno. (2023). What do seniors believe about medication adherence? a qualitative study among seniors with chronic conditions in Yogyakarta, Indonesia. *Patient Preference and Adherence*, *17*, 1381–1392. https://doi.org/10.2147/PPA.S412981

Wiedyaningsih, C., Hakimi, M., Soenarto, Y., & Suryawati, S. (2016). The use of the theory of planned behavior to predict factors influencing physicians' decision to prescribe extemporaneous compounding dosage form for pediatric outpatients. *Asian Journal of Pharmaceutical and Clinical Research*, 288–291.

Yue, Z., Li, C., Weilin, Q., & Bin, W. (2015). Application of the health belief model to improve the understanding of antihypertensive medication adherence Samong Chinese patients. *Patient Education and Counseling*, *98*(5), 669–673. https://doi.org/10.1016/j.pec.2015.02.007