Intervention Digital Medication Reminder App to Improve Hypertension Patient's Self-Management Medication Adherence

Selly Septi Fandinata*, Eziah Ika Lubada, Ninik Mas Ulfa, Rizky Darmawan
Akademi Farmasi Surabaya, Indonesia
Corresponding Author: sellyfandinata@akfarsurabaya.ac.id

ABSTRACT

Among other chronic disorders, hypertension the most common chronic degenerative disease. Patient adherence to treatment is critical to the outcome of hypertension treatment. The provision of a digital medication reminder application intervention is one way to improve medication adherence. This study is to determine the impact of using digital smartphone applications to improve self-management of hypertensive patients. Quasi experimental with 2 prospective groups. The number of study samples was 408 patients. The results were descriptive, the control group had a pre post adherence level at the medium level of adherence, with 111 patients (60.66%) and 108 patients (59.02%). Intervention group at the level of adherence pre Middle 143 patients (63.56%), post 161 patients (71.56%) with a high level of adherence Mann Whitney test analysis, showed a significant change in the level of drug adherence in both groups p value of 0.000. Thus, digital smartphone applications can improve drug adherence.

Keywords: digital application, hypertension, medication adherence

BACKGROUND

Hypertension is a non-communicable disease that is one of the leading causes of premature death in the globe. International Health Organization (WHO) (WHO, 2019) reports that 22 % of the world's population suffers from hypertension. Less than 1/5 of these patients tried to control their blood pressure. Based on fundamental medical research (Kementerian Kesehatan RI Badan Penelitian dan Pengembangan, 2018) In Indonesia, 34.1 % have hypertension. Compared to Riskesdas 2013, when the prevalence of hypertension was 25.8%, this has grown. In Indonesia, only around one-third of cases with hypertension are thought to have a diagnosis; the remainder go unrecognized.

Hypertension, a persistent increase in arterial blood pressure, happens when the systolic pressure reaches 140 mmHg and the diastolic pressure is 90 mmHg. Since hypertension frequently has no symptoms, it is the leading cause of therapy non-adherence. (Nurhidayati *et al.*, 2018)(Riskesdas, 2018). Patients with hypertension should get their blood pressure checked frequently basis because it is a lifetime condition (Saraswati, Ropi and Sari, 2016). Hypertension is a long-term disease and requires long-term treatment as well. Lifelong treatment will affect patient compliance in taking medication (Ozpancar, Pakyuz and Topcu, 2017).

Non-adherence to therapy is a big problem because it causes disease complications for people with hypertension (Saputra and Anam, 2016)(Sunnah and Pujiastuti, 2020). In addition to non-compliance factors, other contributing factors are barriers to treatment due to negligence, not listening to the advice of doctors or pharmacists, lack of knowledge and understanding of taking medicine and, lack of knowledge about the right medication. Thus, close collaboration between health workers and patients is needed (Simpson *et al.*, 2006). Research shows that hypertensive patients' adherence to medication is still low. RISKESDAS data (2018) shows that 32.3% of hypertensive patients do not routinely take medication and 13.3% do not. This non-compliance occurs due to a lack of patient knowledge (Kementerian Kesehatan RI Badan Penelitian dan Pengembangan, 2018). The level of medication adherence needs to be evaluated for hypertension. According to the patient's level of medication adherence, the results of the assessment of medication adherence in hypertension patients can be used to gauge the efficacy of antihypertensive drug therapy and to choose the best intervention strategy (Alsous *et al.*, 2017).

The potential for adherence to medication for hypertension patients is very likely to increase with the use of technology (Forouzanfar *et al.*, 2016)(Dayer *et al.*, 2013). Ownership of mobile phones has been increasing since 2017. One form of using technology to improve medication adherence is the use of smartphone facilities that are integrated with digital applications for medication reminders (Dayer *et al.*, 2013). A survey conducted by (Susanto *et al.*, 2019) This shows that the use of health applications and devices increased by almost 50% among consumers in 2016 compared to 2014. Patients and doctors agree on the benefits of using health applications in disease management. Hypertension is a chronic disease that can be managed using health applications (Morrissey *et al.*, 2018). According to Morrissey et al. (2018) the use of health applications independently has the potential to reduce blood pressure in hypertensive patients (Morrissey *et al.*, 2018).

Applications that are created to help patients manage, reminding medication schedules and medication control schedules, and always being carried around will provide advantages and ease for remembering to take medicine and medication control schedules. Measuring the degree of medication adherence using the MGLS questionnaire (Morisky, Green, Levine Scale), which has been validated and reliability tested and has previously been translated into Indonesian (Fandinata and Ernawati, 2020). Information technology is used in the digital smartphone application. The goal of this study was to evaluate the impact of providing

hypertension patients with primary healthcare services with a digital smartphone application to enhance self-management of medication adherence.

METHODS

With two groups (control and intervention Digital Smartphone adherence application group) pre-post, this study uses a quasi-experimental design and purposive sampling to collect prospective non-probability data from medical record data, MGLS questionnaire prescriptions, and digital smartphone applications. Each question on the pre- and post-MGLS compliance questionnaires that were validated and tested with a value (p 0.05) and a value (KR-20 0.6612) was deemed valid and reliable for measuring the degree of compliance. The Health Research Ethics Committee of the Ministry of Health of the Republic of Indonesia has accepted this study and given it the go-ahead with approval number 130 / EC / KEPK - S2 / 03 / 2022.

According to the following research criteria, the study's samples were outpatients who had been diagnosed with hypertension at the Surabaya City Health Center's primary healthcare facilities were adult outpatients who were diagnosed with hypertension, received antihypertensive drugs and patients who had access to smartphones, WhatsApp, Playstore, and smartphone digital compliance applications.

The two independent samples t-test was used to assess the data in this study, which were coupled with data that were not normally distributed (Wilcoxon). In contrast, the difference in the category mean was assessed using the two independent samples t-test (Mann-Whitney) on paired data that were normally distributed. Adherence levels in the intervention group and the control group.

RESULTS

Taking into account the inclusion and exclusion research criteria, the sample data for this study consisted of 408 patients who were split into two groups: the control group (183 patients) and the intervention group (225 patients), each of whom received the Digital Smartphone compliance application. The information can be seen in table 1.

Table 1. Characteristics of Patient Data

Patient characteristics		Group			
		Control (N = 183)		Intervention (N = 225)	
		N	%	N	%
Gender	Women	88	48,09	122	54,22
	Man	95	51,91	103	45,78
Age (years)	26-35	3	1,64	8	3,56
	36-45	20	10,93	39	17,33
	46-55	45	24,59	64	28,44
	56-65	64	34,97	52	23,11
	> 65	51	27,87	62	27,56
Education	Elementary School	19	10,38	17	7,56
	Junior high school	24	13,11	23	10,22
	Senior High School	82	44,81	118	52,44
	Diploma	2	1,09	4	1,78
	Bachelor	55	30,05	59	26,22
	Master	1	0,55	4	1,78
Occupations	Not working	32	17,49	26	11,56
	Retired	15	8,20	20	8,89
	Housewife	53	28,96	63	28,00

Group	Adherence Level Category	Number of Patients			
		Pre N (%)		*Post* N (%)	
Control	High	34 (18.58)		67 (36.61)	
	Middle	111 (60.66)		108 (59.02)	
	Low	38 (20.77)		8 (4.37)	
Intervention	High	19 (8.44)		161 (71.56)	
	Middle	143 (63.56)		64 (28.44)	
	Low	63 (28)		0	
	Employee	55	30,05	75	33,33
	Enterpreneur	25	13,66	36	16,00
	Teacher	2	1,09	5	2,22
	Farmer	1	0,55	0	0,00
Lifetime of a diagnosis of hypertension (years)	**< 1**	18	9,84	17	7,56
	1 - 3	123	67,21	157	69,78
	4 – 5	20	10,93	29	12,89
	6 – 10	10	5,46	14	6,22
	> 10	12	6,56	8	3,56

Table 1. shows the distribution of patient data characteristics by gender, most of which were female, 210 patients (51.47%), with the highest age range being 56-65 years with 116 patients (28.43%). Based on education, the majority were in Senior High School with 200 patients (49%). Most occupations include employees with as many as 130 patients (31.86%). Based on the duration of being diagnosed with hypertension, the most was 1-3 years, as many as 280 patients (68.63%).

Table 2. Level of Adherence to Medication of Hypertension Patient

Table 2's distribution of medication adherence levels reveals that 111 patients (60.66 %) and 108 patients (59.02 %) in the control group for pre and post measurements had the highest level of adherence, leading researchers to draw the conclusion that the control group was not descriptively present. alterations in the degree of medication compliance in patients with hypertension. The highest pre-measurement was obtained at the Middle compliance level in the intervention group using the Digital Smartphone compliance application, with 143 patients (63.56 %), and the highest post-measurement was at the High compliance level with 161 patients (71.56 %), leading to the conclusion that there was a descriptive increase in the level of adherence to taking medication in the intervention group.Statistical analysis to determine the effect of Digital Smartphone compliance applications on the level of adherence to treatment of hypertensive patients in the control group and the intervention group is shown in table 3.

Tables. 3 Comparison of the levels of changes in adherence to medication between the control and intervention groups

Analysis Statistic	value
Mean Rank Control group < Intervention group	156.7 < 243.38
Averange Control group < Intervention group	0.40 < 0.88
Control group vs Intervention group (*Mann-Whitney test*)	P value = 0.000

The findings of the study of the Mann-Whitney test are presented in Table 3. A p-value of 0.000 indicated that there was a significant difference in the degree of medication adherence between the control group and the intervention group. Additionally, the mean value difference in the level of adherence to taking medication for hypertension patients was higher (0.88) in the intervention group than in the control group. The difference in the level of adherence to medication had a Mean Rank Control and Mean Rank Intervention (156.7 < 243.38) and (0.40). Therefore, it can be deduced that using a Digital Smartphone adherence application can statistically lead to a considerable increase in drug adherence.

DISCUSSION

The risk factors for hypertension are divided into two groups: hypertension that cannot be changed and hypertension that can be changed. Age, gender, education, occupation, and family history are risk factors for hypertension that cannot be changed. While there are risk factors for hypertension that can be altered, such as dietary habits, nicotine, physical activity, alcohol use, salt intake, and eating foods high in fat (Pramana, Dianingati and Saputri, 2019). The characteristics of the sample in this study are included in one of the factors causing hypertension that cannot be changed. The sample data in this study were 408 patients taking into account the inclusion and exclusion study criteria which were divided into 2, namely the control group (183 patients) and the intervention group (225 patients) who were given the Digital Smartphone compliance application intervention. Table 1 of the data show the distribution of patient data characteristics by gender, with 210 patients (51.47%) being female and 116 patients in the 56-65 age group, respectively (28.43 %). According to education, up to 200 patients were in senior high school, which was the majority (49 %). Considering most professions, specifically Employee 130 patients (31.86 %). As many as 280 people have been diagnosed with hypertension for a maximum of 1-3 years (68.63 percent%).

Gender affects the incidence of hypertension, and men have a 2.3 times greater risk of developing hypertension than women because it is suspected that men have a lifestyle that tends to increase blood pressure, such as smoking. In this study, the majority of sexes were women according to the theory that after menopause, the prevalence of hypertension increased in women, and in maintaining health, women usually pay more attention to their health than men. (Rahmatillah, Susanto and Nur, 2020). Gender also has an impact on how people behave when they are sick; women are more likely than males to take care of them selves. (Notoatmodjo, 2012). This is different from the study's results because most of the sexes in Indonesia are female.

Because the risk of hypertension increases with age, age has a significant impact on the incidence of hypertension. The age group in this study was the age range of 56-65 years. As a person ages, the person's blood pressure will also increase. This can be caused by several factors such as natural changes in a person's heart and blood vessels, and these changes occur naturally as the aging process (Whelton *et al.*, 2017). In this study, age is associated with the incidence of hypertension because more respondents are aged 40 years. Age 40 increases the occurrence of hypertension due to natural changes in the body that affect the elasticity of blood vessels, decrease and decrease endurance, and increase age due to the aging process, which makes a person susceptible to disease. (Haswan, 2017).

Education can affect a person, including the behavior or lifestyle, especially in motivating his attitude so that it will affect the incidence of health problems. Low education has the possibility of someone experiencing hypertension due to a lack of information or knowledge that causes unhealthy behavior and lifestyle, such as not knowing about the dangers, as well as prevention of hypertension. The results of this study were mainly the last education, namely Senior High School 200 patients (49%). This is in line with the theory, which says a person's level of education will affect a person's knowledge. The more information that can

influence or increase a person's ability will behave following the knowledge they have. (Notoatmodjo, 2012).

Physical activity is a risk factor for hypertension. The results of this study show that the most employees are 130 patients (31.86%) where the activity is more sitting so that they offer less physical activity, the risk is 1.98 times suffering from hypertension. (17). Physical activity reduces the risk of hypertension by reducing vascular resistance and suppressing the activity of the sympathetic nervous system and the renin-angiotensin system (Riggen and Agarwal, 2014). Aerobics for 30-45 minutes/day effectively reduces the risk of hypertension by 19-30%. Low cardiorespiratory fitness in middle age is thought to increase the risk of hypertension by 50%. Inactive people tend to have a higher heart rate. The higher the heart rate, the more complex the heart works with each contraction and the stronger the pressure on the artery walls. (Tsiantou, 2010).

Antihypertensive drugs play a role in helping lower and stabilize blood pressure and reduce the risk of complications due to hypertension. (Yonata and Satria, 2016). Multiple factors, including drug choice, cost of care, length of hypertension diagnosis, knowledge of hypertension, role of healthcare professionals, absence of family and social support, level of recent education, and socioeconomic circumstances, contribute to non-adherence to hypertension treatment.(Patel *et al.*, 2013).

Patients who have experienced hypertension for one to five years tend to adhere more to the process of taking medication because of their great curiosity and desire to recover, while patients who have had hypertension for six to ten years tend to have poorer drug adherence. This is due to more patient experiences, where patients who have complied with the treatment process but the results obtained are not satisfactory. Hence, patients tend to surrender and do not comply with the treatment process. Patient saturation factor. Hypertension undergoing treatment or taking the drug and the cure rate achieved is not as expected can also be a factor in non-adherence. The doctor will typically add another medication or slightly increase the dosage for patients who have had hypertension for a long time but have not yet fully recovered because it is possible that other complications diseases have begun to manifest as a result of the prolonged hypertension treatment. Due to this, the patient has a propensity for disobedience. (Yanti *et al.*, 2020).

Hypertension therapy is a long-term therapy that does not cure but only controls blood pressure and prevents complications. Therefore, adherence to drug use is essential to the success of hypertension therapy. One of the interventions is using reminder media to increase the patient's medication adherence to improve the patient's quality of life. The results of the level of adherence to taking medication which is presented in table 2, show that in the control group, for the most pre and post-measurements at the level of adherence to Middle, as many as 111 patients (60.66%) and 108 patients (59.02%) so that it was concluded in the control group as follows: descriptively, there is no change in the level of adherence to medication in hypertensive patients. In the intervention group for the pre-measurement, the highest level of adherence was Middle as many as 143 patients (63.56%). In the post-measurement, it became a High level of adherence among as many as 161 patients (71.56%), so it can be concluded that descriptively there was an increase in the level of adherence to taking medication in the intervention group.

The results of the Mann-Whitney test analysis showed significant differences in the level of adherence to taking medication, both in the control group and in the intervention group, as evidenced by a p-value of 0.000. In addition, the difference in the level of medication adherence had a Mean Rank Control < Mean Rank Intervention (156.7 < 243.38), and the mean value difference in the level of adherence to taking medication for hypertension patients was higher (0.88) in the intervention group than in the control group (0.40). So it can be concluded

statistically that the administration of the Digital Smartphone compliance application can significantly increase drug adherence.

This shows that the use of the Digital Smartphone compliance application can have a positive impact on increasing patient medication adherence. These results are in line with research. (Morrissey *et al.*, 2018) They are Applied to 48 hypertensive patients in America. The use of automated medication reminder applications for mobile phones is effective in significantly increasing patient medication adherence. Other research conducted (Alfian and Wardati, 2016) Hypertensive patients at a hospital in Banjarmasin also showed that my pillbox reminder application used in hypertensive patients effectively improved medication adherence. The use of smartphone applications for hypertensive patients can help improve medication adherence so that therapeutic goals in the form of controlling blood pressure within normal limits can be achieved. (Alfian and Wardati, 2016).

The use of the Digital Smartphone adherence application to improve medication adherence is possible in Indonesia, and now many have smartphones. The public already understands the importance of information and the ease with which internet networks can be accessed. This technology is also beneficial for people whose homes are far from health services because health information is easily accessible and not limited by time and circumstances. Communication can also be done in two directions.

CONCLUSION

The delivery of the Digital Smartphone compliance application for hypertension patients has been reported to significantly increase medication adherence, according to the study's findings, which support this conclusion.

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