

Effect of Health and Nutrition Education on Blood Pressure, Knowledge and Compliance among Hypertensive Patients in Bogor District, Indonesia: A Control Quasi-Experiment

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Abstract

With a high prevalence of hypertension (25.8% in 2013 and 34.1% in 2018), Indonesia currently deals with a tremendous health economic burden with the implementation of National Health Insurance (JKN). Hypertension is known to lead to severe complications and productivity loss. This study aimed to evaluate the effect of health and nutrition education on blood pressure knowledge and compliance among hypertension patients. The study was conducted over a period of 6 months in Bogor District. A total of 179 patients (64%) completed the study (intervention n = 88, control n = 91). Compared to the control group, patients in the intervention group showed a significant improvement of knowledge and compliance ($p < 0.001$), yet no significant difference of blood pressure was observed. However, there was a significant mean reduction of systolic and diastolic blood pressure between baseline and end-line by around 17mmHg and 8 mmHg, respectively by the intervention group. In conclusion, health education over 6 months was related to significant improvement in blood pressure knowledge and compliance of hypertension patients.

Keywords: hypertension patients, health and nutrition education, blood pressure, knowledge, compliance

Abstrak

Dengan tingginya prevalensi hipertensi (25.8% dan 34.1% pada tahun 2013 dan 2018), Indonesia saat ini menghadapi beban ekonomi Kesehatan yang besar dengan diimplementasikannya Jaminan Kesehatan Nasional (JKN). Hal ini disebabkan hipertensi dapat menyebabkan beragam komplikasi kesehatan yang serius dan penurunan produktivitas. Studi ini bertujuan untuk mengevaluasi pengaruh edukasi gizi dan kesehatan terhadap pengetahuan, kepatuhan, dan tekanan darah pasien hipertensi selama 6 bulan pada sebanyak 179 pasien (64%) yang berhasil menyelesaikan rangkaian studi ini (jumlah subjek pada kelompok intervensi = 88 dan jumlah subyek kelompok kontrol = 91). Dibandingkan dengan kelompok kontrol, penderita hipertensi pada kelompok intervensi menunjukkan peningkatan pengetahuan dan kepatuhan yang signifikan ($p < 0.001$), meski tidak ditemukan perbedaan tekanan darah antara kedua kelompok. Meskipun demikian, studi ini menunjukkan adanya penurunan tekanan darah sistolik dan diastolik antara baseline dan endline masing-masing berkisar 17 mmHg dan 8 mmHg. Sebagai kesimpulan, edukasi kesehatan berkaitan dengan peningkatan pengetahuan dan kepatuhan pasien yang signifikan, meski dibutuhkan waktu yang lebih panjang untuk mengobservasi perbedaan tekanan darah antara kedua kelompok.

Kata Kunci: Hipertensi, edukasi gizi dan kesehatan, tekanan darah, pengetahuan, kepatuhan

Introduction

In the last 4 decades, Indonesia has experienced a decreasing mortality rate caused by communicable diseases from 60% in 1980 to only 40% in 2007, while non-communicable diseases have extremely raised from 30% to 60% with about half of them caused by cardiovascular diseases (CVDs), including hypertension, stroke, and coronary heart disease (1). As a developing country, Indonesia found specifically, hypertension, as one of the leading cause of costly complications and death due to the lack of blood pressure control, changes in eating habits, psychological stress, and aging of population (2).

It is established that deaths caused by CVDs have strong relationships with other chronic diseases, especially hypertension (3). Based on Indonesia Basic Health Survey 2013 and 2018, it was revealed that 25.8% and 34.1% of adults, respectively, suffered from hypertension (4,5). It was estimated that the prevalence of hypertension will increase every year since people tend to have unhealthy lifestyle (6). It was reported that about 60% of adult males were smokers, while 90% of them smoked at home every day which made other family members were getting exposed (passive smokers). Also, about 90% of Indonesian people consumed less fiber (fruits and vegetables) and had less physical activity (4). Hypertension is highly related to someone's intake that is driven by their behavior to choose their food and compliance to healthy lifestyle (7).

One of the effective methods to control hypertension is through counseling by a nurse (8). There have been many studies that proved the effectiveness of efforts to control hypertension. A systematic review in 2011 found that an intervention by

nurses lowers blood pressure better than doctors (9). This method is a choice to be adapted in controlling blood pressure for Indonesian people, while there is low awareness of health.

Prevalence of non-communicable diseases (NCD), such as hypertension is increasing every year in Indonesia. In addition, patients' case fatality rate is the highest one compared by any other diseases. Hypertension also has the largest prevalence from other CVDs and ironically, more than a quarter of Indonesian people suffer from it while only 10% of them aware about this condition (physicians' diagnosis or consuming anti-hypertensive drugs) (4).

As one of the community development area for NCD Directorate of Ministry of Health, Bogor, a suburban area in West Java, which has a high prevalence of hypertension (10) and potentially leads to high risk of costly complications, such as stroke, chronic heart disease (CHD), kidney failure, blindness, and so on (11,12). By the implementation of National Health Insurance named *Jaminan Kesehatan Nasional* (JKN) in Indonesia from early 2014, curative approach is predicted to spend a lot of money and encumber the state. Therefore, preventive approach is urgently needed to control hypertension and its treatment cost. The objective of this research was to evaluate the effect of health and nutrition education on hypertensive patients' knowledge, compliance and blood pressure for 6 months.

Methods

This quasi-experimental study was conducted in December 2013 – October 2014 in 3 community health centers (*Puskesmas*) in Bogor District, West Java. The eligible subjects were 30–65-year-old males and females with ≥ 140 mmHg for systolic blood pressure (SBP)

and/or ≥ 90 mmHg for diastolic blood pressure (DBP), or those who consumed any anti-hypertensive drugs. There were one *Puskesmas* as the intervention area (Bojonggede *Puskesmas*) and two for the control (Gunung Putri and Gunung Sindur *Puskesmas*) selected purposively, since there were limited patients in control *Puskesmas*. The eligible subjects were not randomly chosen. It was done by asking patients permission to participate in the study based on their visits (opportunistic sampling). It was at least the first 100 patients who visited the health care facilities, both intervention and control area in the baseline. Additional number of patients was recruited to anticipate the dropout rate. 279 patients were then followed for 6 months, where health education, medications and blood pressure check were given in the intervention area, while in control one, only blood pressure measurement and medications were provided.

Qualitative assessment

The study was initiated with a qualitative assessment in order to develop a module to be delivered in the intervention area. It involved a psychologist and health experts including nutritionist and cardiologists. Psychologist took an important role in giving many insights of constructing a comprehensive and high impact module and health promotion media. Therefore, we developed different kinds of media which involved as many human senses as possible. It was aimed to strengthen the retain effect of given information. On the other hand, cardiologists and nutritionist provided us with important health information, particularly about the pathology of diseases and how to control them by modifying eating habit, respectively to be included in the module and media promotion. We developed

different forms of videos, leaflets, games, guidance to select healthy food, cooking simulation, aerobic exercise, and also sharing session where patients can freely discuss about their experience regarding hypertension with the health care workers and other patients. It was aimed to reduce their level of stress.

Module and Media Development

Based on the assessment, a module was developed by including six chapters, using different kind of media to support each month delivering. Every chapter was delivered in each month sequentially. There were Module 1 (Definition of Hypertension), Module 2 (Complications of Hypertension), Module 3 (Healthy Diet), Module 4 (Diet Modification), Module 5 (Healthy Life Style), and Module 6 (Diet and Medication Compliance). Every module employed videos, leaflets and interactive discussions, along with food selecting and cooking simulation in Module 3 and 4, respectively, as well as aerobic section for elder people in Module 5. Videos and leaflets were developed by concerning patients' acceptability measured by a questionnaire and adjusted to fit local culture and language.

Personnel Training

Nurses in intervention group were trained to use developed module and asked to routinely measure the same patients' blood pressure each month, while nurses in control group were only need to measure patients' blood pressure. Nurses in both area were also trained to use the questionnaire to assess patients' knowledge and compliance about hypertension. Patients in both areas received routine medications as they were asked to attend the *Puskesmas* every month.

Module, Media Try Out and Questionnaire Validation

There were 6 different modules with each related education media employed in this study, namely: 1) Symptoms, Risk Factors, Complication, and Blood Pressure Test for Hypertensive Patients; 2) Hypertension Pathophysiology, Impact, Treatment, and Complication Prevention; 3) Diet for Hypertension; 4) Motivation to Implement Diet for Hypertension; 5) Motivation to Implement Healthy Lifestyle for Hypertension; and 6) Hypertensive Patients Compliance. Each module exposure is expected to increase patient's awareness on hypertension, including the importance of medication and routine blood pressure measurement to control their blood pressure.

Module, education media, and questionnaire were tested to 20 eligible patients of *Posbindu* (Integrated Development Station for Elderly) around Universitas Indonesia which has a similar character with intervention and control area. The questionnaire was designed to measure patients' knowledge and compliance regarding hypertension and health, as better knowledge is not a guarantee for better compliance. The content of questionnaire was period of blood pressure test, routine exercise, suggested and avoided food, weight measurement, stress management, smoking behavior, complications and healthy life style. By using this questionnaire, patients' compliance was assessed to figure out whether or not the patients adhere with what they have with their knowledge. In this questionnaire, patients' self-reported responses on whether they keep consuming the medications despite not experiencing any symptoms or reminded by the family/health care workers, routinely measure their blood pressure and body weight, and other few

questions on compliance to diet and medications were asked. There are several advantages of using the self-report questionnaire, including the ability to be administered to a large sample of people quickly and more effective in terms of effort and financial cost (13). However, the result needs to be interpreted carefully, since using self-reported questionnaire, the respondents are prone to give answers that is more socially acceptable or called social desirability bias, especially for sensitive questions. However, in this study, most of the questions are considered not to be too sensitive and encourage the respondents to answer truthfully as they treat the questions as an opportunity to report their self-views (14). Nevertheless, direct observation on behavior change might be necessary to objectively measure the impact of the intervention, although it would require enormous amount of effort, time, and cost.

Intervention and Monitoring

April 2014 was the baseline of the study. 100 patients in each area were involved and health education was started in intervention group. Both groups had the same blood pressure check, pre-post knowledge and compliance measurement for the next 5 months to October 2014. Both groups are separated for 25 km far (1 hour driving), that is considered convenient to ensure that cross transfer of knowledge from intervention to control group is avoided (15). Formal invitation from Puskesmas and personal contact were routinely given by the nurses to ensure patients' attendance every month in intervention group. There were 2-4 visits every month conducted to meet the required number of patients. Blood pressure was measured at the end of each education session for 2-3 times to get the most

reliable one by using aneroid sphygmomanometer with average measurements taken. Research teams monitored the process of intervention and blood pressure check two or three times per month in intervention area and one or two times for every two months in control one to check data reliability.

Statistical Methods

The data was analyzed using paired t-test to compare baseline and end-line blood pressure and score of knowledge and compliance means. All statistical analysis was done using SPSS version 17 for Windows with p-value < 0.05 indicated as statistically significant

Results

Characteristics of the Sample

By the end of the study, 88 out of 105 patients had been observed in intervention area, while in control, there were 91 out of 174 patients had been followed for 6 months. Based on Table 1, in both areas, most of the patients were female and housewives, whereas in control area, the participants tended to be older.

Blood Pressure Mean

The study found that during 6 months, both intervention and control groups experienced a significant declined blood pressure, both systolic blood pressure (SBP) and diastolic blood pressures (DBP) (p-value = 0.001).

Control and intervention group's SBP declined for approximately 18 mmHg, while both DBP reduced about 7 and 9 mmHg respectively (Graphic 1). Table 2 shows the significance of blood pressure's slope between baseline and end-line in both areas. However, in each module, there was no significant difference of blood pressure found between control and intervention group (p - value > 0.05).

Mean Score for Knowledge and Compliance

In addition to blood pressure, other dimensions used to assess the behavioral change and healthy lifestyle that will affect the occurrence of complications were measured, namely knowledge and compliance (5).

Within each groups, Table 3 below illustrates that in intervention area, there was a significant improvement of knowledge and compliance by the end of the study, while the score of control area was declined, instead. Control group had higher score of knowledge at the baseline level compared to intervention, but then it was declined significantly (p-value<0.05), while their compliance were slightly decreased. On the other hand, intervention group showed significant improvement for knowledge and compliance.

Table 1. Distribution of Intervention and Control Patients

Variable		Intervention n (%) (n=105)	Control n (%) (n=174)
Sex	Male	16 (15.2)	36 (20.7)
	Female	89 (84.8)	138 (79.3)
Age	≤50 years old	54 (51.4)	81 (46.6)
	>50 years old	51 (48.6)	93 (53.4)
Occupation	Housewives	73 (69.5)	140 (80.5)
	Employees	15 (14.3)	24 (13.8)
	Traders	10 (9.5)	9 (5.2)
	Retired	7 (6.7)	1 (0.6)

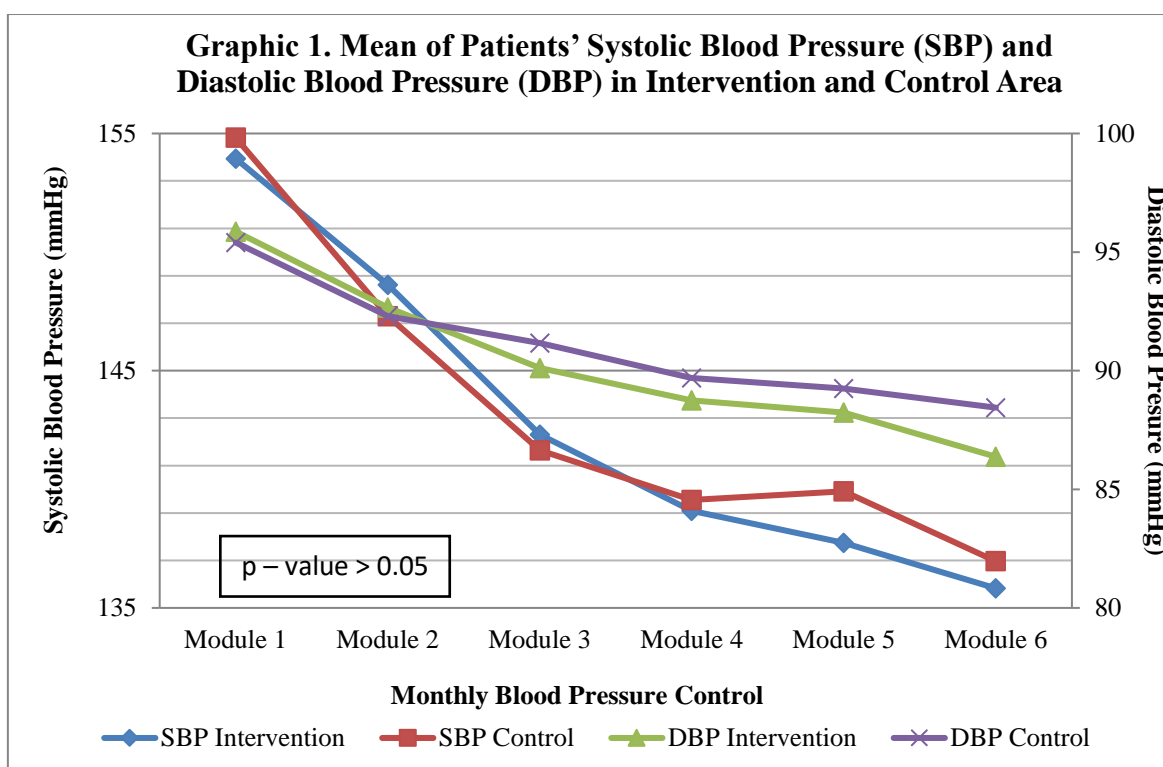
Table 2. Comparison of Blood Pressure Reduction in Each Area

Blood Pressure		Mean ± SD	Mean ± SD End-	p-value
		Baseline (mmHg)	line (mmHg)	
SBP	Control (n=122)	154.66±18.67	136.97±7.26	0.001***
	Intervention (n=91)	153.24±23.47	135.82±21.39	0.001***
	TOTAL (N=213)	154.06±20.82	136.48±14.99	0.001***
DBP	Control (n=122)	95.98±10.09	88.44±4.64	0.001***
	Intervention (n=91)	95.93±12.73	86.37±9.72	0.001***
	TOTAL (N=213)	95.96±11.27	87.56±7.31	0.001***

* = Level of significance p-value < 0.05

** = Level of significance p-value < 0.01

*** = Level of significance p-value < 0.001

**Table 3. Changes of Knowledge and Compliance Score within Intervention (I) and Control (C) Area**

Variable (within I-C)	Baseline Mean ± SD	End-line Mean ± SD	Deviance Rate	p-value
Control (N=91)				
Knowledge	84,98	67,58	-17,4	0.001***
Compliance	22,18	21,64	-0,54	0.614
Intervention (N=88)				
Knowledge	75,95	84,94	8,99	0.001***
Compliance	65,08	74,48	9.4	0.001***

* = Level of significance p-value < 0.05

** = Level of significance p-value < 0.01

*** = Level of significance p-value < 0.001

Discussion

This study aimed to distinguish hypertensive patients' blood pressure, knowledge and compliance who received health education in comparison to those who did not. The intervention was done using several tools designed for 6 months period of time. By understanding the optimal effect of health education in treating hypertension, it is expected that future hypertension management could optimize health promotion even better in combination with medication.

Compared to intervention group, control group had considerably lower follow-up rate, 88% vs 52%, respectively. Plausible reasons behind this were: 1) more private general practitioners were observed operating around the Puskesmas in the control area, so that more patients did not show up in the next visit as they preferred to use private clinics. It was presumed that they thought they can get quicker response there, 2) the number of hypertensive patients visiting Puskesmas in the control area were not as many as those in the intervention area due to its accessibility, 3) in control group, no invitation letters were issued to see their natural compliance, so that the participants tend to think that taking part in the study was not compulsory.

The participation rate of less than 80% is considered to be suboptimal as a follow-up rates of longitudinal study (16). Drop out was usually occurred due to unreachable or hospitalized patients. We found it difficult to reach patients in the following months because their phone numbers and addresses were no longer reliable. This is presumably because the participants were most likely to be temporal residents in those area and tended to easily change their phone number in order to find the best value phone provider. This finding aligns with

previous study suggested that people with lower socioeconomic status were more likely to drop-out (17). However, trained nurses and students were assigned to undergo visits to patients' home only when needed to get blood pressure, knowledge and compliance score. This was done by the assistance of patients' nearest health care workers or health volunteer (cadre) who were usually kept update about the current condition, including address of the patients. This approach was done by considering negative effects of recruiting new patients that is known not to be a guarantee to avoid selection bias. This is supported by previous study suggested that patients involved by additional recruitment or personally approached by the health care workers tended to have poorer health and lower quality of life (18).

Furthermore, additional effort made to boost the recruitment rate in the control area was considered to be ineffective as most of the people recruited did not routinely check their blood pressure in the Puskesmas and inviting them to come was considered to introduce bias for the compliance rate. Although dropout rate was not considered to be related to the main outcomes of the study, its related factors still have to be identified in order to avoid potential confounders in the analysis (19). This finding aligns with previous study suggested that follow-up rates were depending on 1) the age of subjects (control area had higher proportion of older people that was considered to feel less comfortable or willing to participate in this kind of study) (20), 2) perceived benefit of the study, 3) the ability and sustainability to trace and contact subjects (16), 4) high exclusion criteria, and 5) limited resources (21). However, as the study design employed is based on convenient

sampling, the findings need to be interpreted more carefully.

In this study, significant blood pressure reduction detected in both areas was considered to be associated with the medication adherence as patients in both groups were prescribed with similar drugs, e.g. amlodipine or nifedipine as well as routine measurement (22). These activities were thought as positive trigger for the patients to change their health behavior.

Although significant difference between both groups' blood pressure was not detected during 6 months, remarkable difference was illustrated on patients' knowledge and compliance. Higher knowledge and compliance score of patients in the intervention area compared to control both in the baseline and end-line showed that health education given was successfully improve their awareness and health behavior.

As the media was designed based on both qualitative and quantitative methods to ensure its acceptability to the patients, it was considered to be useful for health care workers to conduct health education and promotion periodically. It also potentially helps the patients to improve their knowledge about hypertension and its complications, and eager them to initiate in changing their lifestyle.

However, the intervention was done only for 6 months and this period was considered to be suboptimal to observe any behavior change or even to maintain it. Studies suggested that desirable behavior change seemed to be more likely to observe in 12 months or more, especially conducted in developing countries (23,24). Therefore, longer observation is needed to get further information regarding patients' compliance and complications occurred. The study also had limited number of

patients involved since there was about 10% drop out and thus, future study should involve larger participants to obtain the most representative result. As this was a cross-sectional study, causal effect cannot be drawn. Therefore, evidence whether education effects the BP or the other way around could not be established. However, this study suggests that the declining of blood pressure in both groups is presumably related to the encouragement of medication adherence and routine blood pressure measurement in the Puskesmas and Posbindu by the health care workers, especially nurses

Conclusion

Compared to control group, patients in the intervention group showed a significant improvement of knowledge and compliance ($p < 0.001$), yet no significant difference of blood pressure was observed. However, there was a significant mean reduction of systolic and diastolic blood pressure between baseline and end-line in intervention group by around 17mmHg and 8 mmHg, respectively. In conclusion, health education is related to remarkable improvements in patients' knowledge and compliance, yet longer time is needed to observe any difference in blood pressure between both groups.

Ethical Clearance

This quasi-experimental study obtained the ethical approval from Faculty of Public Health, Universitas Indonesia Research Ethics Committee with the project ID: 14/H2.F10/PPM.00.02/2014

Acknowledgment

This study was conducted as a research project in Center for Health Economic and Policy Studies, Faculty of Public Health, Universitas Indonesia.

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