

ORIGINAL ARTICLE

Effect of an information technology integrated health education program on blood pressure level of adults with uncontrolled hypertension in a private hospital in Bangkok, Thailand

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Abstract

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In Thailand, hypertension ranks third as a major risk factor that is associated with national disease burden. Though there are a number of studies done on the effects of a multi-faceted health education on behavior changes in uncontrolled hypertension patients (to decrease blood pressure or BP), few had been done in private hospitals, with utilization of social media, and none had been done using the combination of lectures, animations, info-graphics and LINE in Bangkok, Thailand. The study objective is to evaluate the effect of the Information Technology Integrated Health Education program (ITIHEP) on the BP of uncontrolled hypertension patients in a private hospital in Bangkok.

A randomized controlled trial (RCT) was conducted in a private hospital in Bangkok. Sixty-eight participants with uncontrolled hypertension were randomly allocated into the intervention and control group. Patients in both groups would receive standard medical care. Intervention group participants would also receive the ITIHEP, which includes health education with animations, info-graphics, and the use of IT-component of LINE to promote behavior changes for hypertension control and ultimately improve BP. BP would be tracked using automatic blood pressure monitor. Data were analyzed in SPSS 17.0 using descriptive statistics, unpaired t-test, Chi-Square Test, Fisher's Exact test, Repeated-Measures ANOVA, and post-hoc test.

Analysis showed that there were significant differences of SBP between intervention and control group ($P \leq .001$). There are no significant differences between the control and intervention groups for DBP ($P = .011$), but post-hoc test suggests that both groups experienced decrease in DBP, but at the same level, reaching the realms of normal DBP of 80 mmHg. The ITIHEP tends to be beneficial in helping patients with uncontrolled hypertension to considerably increase their rate of decrease in BP compared to when receiving only standard medical care.

Keywords: hypertension, health education, information technology integrated health education program, randomized controlled trial

ผลของโปรแกรมสุขศึกษาแบบบูรณาการด้านเทคโนโลยีสารสนเทศต่อระดับความดันโลหิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูงที่ไม่สามารถควบคุมได้ในโรงพยาบาลเอกชนแห่งหนึ่ง ในกรุงเทพมหานคร ประเทศไทย

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บทคัดย่อ

วิชเรศ บุญจิตต์พิมล และ รัตนา ลำโรงทอง ผลของโปรแกรมสุขศึกษาแบบบูรณาการด้านเทคโนโลยีสารสนเทศต่อระดับความดันโลหิตของผู้ใหญ่ที่มีภาวะความดันโลหิตสูง ที่ไม่สามารถควบคุมได้ในโรงพยาบาลเอกชนแห่งหนึ่ง ในกรุงเทพมหานคร ประเทศไทย ว.สาธารณสุขและการพัฒนา 2562;17(2):51-61

โรคความดันโลหิตสูง มีปัจจัยเสี่ยงสำคัญเกี่ยวข้องกับสุขภาวะโรค เป็นอันดับ 3 ของประเทศไทย แม้ว่าจะมีผลการรักษาที่เกี่ยวข้องจำนวนมากอธิบายปัจจัยที่สำคัญของโรคความดันโลหิตสูง มีความเกี่ยวข้องกับความรู้ด้านสุขภาพ ทักษะการตัดสินใจและการเปลี่ยนแปลงพฤติกรรมในผู้ป่วยที่มีความดันโลหิตสูงที่ไม่สามารถควบคุมได้ แต่การใช้เทคโนโลยีสื่อสังคมออนไลน์ในการให้ข้อมูลเกี่ยวกับสุขภาพยังมีความน้อยและในพื้นที่กรุงเทพมหานคร ยังไม่มีการศึกษา ที่ใช้เทคโนโลยีสื่อสังคมออนไลน์ผสมผสานระหว่างอินโฟกราฟิก ภาพเคลื่อนไหว การบรรยายผ่านสื่อแอปพลิเคชัน LINE ดังนั้นการวิจัยครั้งนี้มีวัตถุประสงค์เพื่อประเมินผลของโปรแกรมสุขศึกษาแบบบูรณาการด้านเทคโนโลยีสารสนเทศต่อการลดระดับความดันโลหิตสูงของผู้ใหญ่ที่มีภาวะความดันโลหิตสูงที่ไม่สามารถควบคุมได้ในโรงพยาบาลเอกชนแห่งหนึ่งในกรุงเทพมหานคร

ดำเนินการเลือกกลุ่มประชากรแบบสุ่ม ในโรงพยาบาลเอกชนในกรุงเทพมหานคร (ประเทศไทย) มีผู้เข้าร่วมจำนวน 68 คนซึ่งเป็นผู้ใหญ่ที่มีโรคความดันโลหิตสูงที่ไม่สามารถควบคุมและจัดเข้ากลุ่มทดลองและกลุ่มควบคุม โดยวิธีการสุ่มในขณะที่ผู้ป่วยทั้งสองกลุ่มจะได้รับการดูแลรักษาตามมาตรฐานการดูแลสุขภาพทางการแพทย์ ผู้ที่อยู่ในกลุ่มทดลองจะได้รับเทคโนโลยีสารสนเทศ โปรแกรมการศึกษาสุขภาพแบบบูรณาการด้วยเทคโนโลยีสารสนเทศซึ่งเป็นการผสมผสานระหว่างการใช้การบรรยายเรื่องสุขภาพกับภาพเคลื่อนไหว อินโฟกราฟิก ข้อมูล และโซเชียลมีเดียผ่านแอปพลิเคชัน LINE เพื่อสร้างโปรแกรมการให้ความรู้และทัศนคติเชิงบวก เพื่อเปลี่ยนแปลงพฤติกรรม อันจะนำไปสู่การลดของระดับความดันโลหิต ในการประเมินผลลัพธ์ของการเปลี่ยนแปลง ความดันโลหิตของกลุ่มทดลองและกลุ่มควบคุม ในช่วงระยะเวลาเริ่มต้น, 3 เดือน และ 6 เดือน จะถูกนำมาวัด วิเคราะห์ข้อมูล โดยใช้สถิติเชิงพรรณนา t-test หรือ Mann-Whitney test Fisher's Exact test Repeated-Measures ANOVA (RM-ANOVA) และ post-hoc test.

ผลการศึกษาพบว่ามีความแตกต่างอย่างมีนัยสำคัญของ ค่าความดันโลหิตตัวบน (SBP) ระหว่างกลุ่มทดลองและกลุ่มควบคุม ($P \leq 0.001$) แต่ไม่พบความแตกต่างอย่างมีนัยสำคัญระหว่างกลุ่มควบคุมและกลุ่มทดลองสำหรับค่าความดันโลหิตตัวล่าง (DBP) ($P = 0.011$) จากการวิเคราะห์ค่าความแปรปรวนของระดับค่าความดันโลหิตตัวล่าง(DBP)ของกลุ่มทดลองและกลุ่มควบคุมพบว่ามีความดันโลหิตลดลง แต่ทั้งสองกลุ่ม ค่า DBP ลดลง เข้าใกล้ 80 mmHg ซึ่งใกล้เคียงกับค่า DBP ของคนปกติ โปรแกรมสุขศึกษาแบบบูรณาการด้านเทคโนโลยีสารสนเทศมีแนวโน้มที่จะเป็นประโยชน์ในการช่วยเหลือผู้ป่วยโรคความดันโลหิตสูงที่ไม่สามารถควบคุมได้ให้ปรับเปลี่ยนพฤติกรรมการควบคุมความดันโลหิตและทำให้ลดอัตราความดันโลหิตสูงเมื่อเทียบกับการได้รับการรักษาตามมาตรฐานทางการแพทย์เพียงอย่างเดียว

คำสำคัญ: โรคความดันโลหิตสูง โปรแกรมสุขศึกษา โปรแกรมสุขศึกษาแบบบูรณาการด้านเทคโนโลยีสารสนเทศ การทดลองแบบสุ่มและมีกลุ่มควบคุม

Introduction

Hypertension, defined by the World Health Organization as “high or raised blood pressure”, “a condition in which the blood vessels have persistently raised pressure”¹, is considered to be one of the major public health challenges worldwide.² Uncontrolled hypertension is the condition of high blood pressure which is nonresponsive to conventional treatments or has gone untreated, often identified by blood pressure (BP) greater than or equal to 140/90 mmHg.³ Controlled hypertension is simply the opposite of uncontrolled hypertension, with conditions able to be effectively treated, proper care given, and BP below 140/90 mmHg.⁴ According to the 5th National Health Exam Survey, the prevalence of hypertension in Thailand among adults (aged 15 and above) was 24.7% between 2014 to 2015.⁵ In Thailand, hypertension is ranked the third in being a major risk factor associated with national disease burden.⁶

There are two major ways to deal with hypertension, including making lifestyle changes and using medical treatments.⁷ Despite the presence of medical treatments to hypertension, studies revealed that less than 25% of patients treated with hypertension actually reached ideal blood pressure.⁸ This is so due to barriers that averts effective solution exertion.⁹ Major barriers that prevented solutions for treating hypertension included the lack of knowledge of the nature of hypertension and how to deal with the disease⁹, and the lack of positive attitude and effort to fully cooperate with physicians on making lifestyle changes and adhering to medical treatments¹⁰. As is commonly known, lack of knowledge, positive attitude and effort could be

enhanced by providing health education.¹ A study titled “The effects of health education on patients with hypertension in China: A meta-analysis” by Xu et al., indicated how patients with hypertension who received health education have substantially lowered systolic and diastolic blood pressures.¹¹ This, thus, could remove barriers that prevent for a successful hypertension treatment. There are numerous tools for health education, to which, in the past few decades, information technology has risen to become one of them.¹² Until present, there are increasing uses of modern technology in the fields of public health in an infinite number of ways.¹³ Health education may be fused with information technology (IT) to achieve this goal.¹²

The Information Technology Integrated Health Education program (ITIHEP) is a multi-faceted health education program, with its contents and media designed for this study, to provide patients with knowledge, positive attitude, and provoke positive behavior-changes for hypertension and control, to ultimately decrease BP. The issues of this study addressed towards hospital patients in the private sector was due to the fact that though there were a number of studies done on the effects of a multi-faceted health education on BP of patients with uncontrolled hypertension, few had been done in private hospitals, and to the author’s knowledge, none had been done using the combination of workshops, animations, info-graphics and LINE in the premises of Bangkok, Thailand. This study aimed to evaluate the effect of the ITIHEP on the blood pressure level of adult patients with uncontrolled hypertension in a private hospital in Bangkok, Thailand.

Methods

This two-arm, RCT study divided participants into the intervention and control group, purposively selected from the population of adults aged between 35 to 60 years in a private hospital in Bangkok, Thailand. The intervention group received the ITIHEP with typical standard medical care protocols. The control group received only typical standard medical care protocols. The total sample size was 68, with 34 in each groups. The ITIHEP consisted of health education workshops, animations and hand-outs (regarding hypertension control knowledge, exercise, stress management, diet control, alcohol, smoking, medical adherence), along with use of LINE as an IT-component to send health messages and info-graphics. All health education contents and tools (such as info-graphics and health messages in LINE) are specifically designed for this study.

The study included participants who were diagnosed with uncontrolled hypertension and no other diseases, with average systolic blood pressure (SBP) > 140 mmHg and average diastolic blood pressure (DBP) > 90 mmHg. The subjects must also be prescribed with BP-lowering medication which included (ACEi, Angiotensin-Converting-Enzyme inhibitor or ARB, Angiotensin II Receptor Blockers) + (CCB, Calcium Channel Blockers or Diuretic). Those who were pregnant or within 3 months post-partum, with an SBP > 200 mmHg or DBP > 100 mmHg, suffering from severe vision-impairments, engaged in therapeutic courses other than medical treatment which involved helping to treat hypertension by any

other means, or taking regular medications that may worsen conditions of hypertension were excluded from the study. Ethical clearance has been approved by the Ethics Review Committee for Research, Chulalongkorn University and the study-hospital (Hospital Certificate of Approval Number 003/2018).

The questionnaires consisted of demographics and health-related factors (36 questions) and knowledge, attitude and practice regarding hypertension and control questionnaires that have been tested for validity and reliability. The automatic blood pressure monitor was used to measure BP. Data were collected at baseline, 3 months and 6 months. SPSS Statistics Version 17.0 licensed for Chulalongkorn University was used for data analysis. Statistical analyses included descriptive statistics, unpaired t-test, Fisher's Exact test, Chi-Square test, Repeated-Measures ANOVA (RM-ANOVA) and post-hoc test. The assumption of sphericity was met.

Results

The mean age of participants was 52.56 years, 57.4% were females and 55.9% had family history of hypertension. There were no significant differences between the intervention and control group for demographic characteristics (age, gender, educational level, average income, employment status, marital status and health-related factors (family history of hypertension and body mass index)) as shown in Table 1. Moreover, there are no significant differences in SBP and DBP between both groups at baseline (Table 2).

Table 1 Comparison of general characteristics between intervention and control group

Variables	Category	Control (n=34)		Intervention (n=34)		Total (n=68)		P-value
		Frequency	Percent	Frequency	Percent	Frequency	Percent	
Age (years)	35-45	2	5.9	8	23.5	10	14.7	.105 ¹
	46-54	11	32.4	11	32.4	22	32.4	
	55-60	21	61.8	15	44.1	36	52.9	
	Mean	54.24		50.12		52.56		
	SD	5.43		8.84		7.03		
Gender	Male	14	41.2	15	44.1	29	42.6	.806 ²
	Female	20	58.8	19	55.9	39	57.4	
Educational level	Less than Bachelor Degree	27	79.4	21	61.8	48	70.6	.110 ²
	Bachelor Degree or higher	7	20.6	13	38.2	20	29.4	
Average income (USD/month)	Less than 471	27	79.4	18	52.9	45	66.2	.069 ²
	471-1257	7	20.6	16	47.1	23	33.8	
Employment Status	Unemployed	14	41.2	9	26.5	23	33.8	.173 ²
	Private Company Worker	11	32.4	9	26.5	20	29.4	
	Freelance/Merchant, Business	9	26.5	16	47	25	36.8	
	Single	5	14.7	12	35.3	17	25.0	
Marital Status	Married	23	67.6	17	50.0	40	58.8	.270 ²
	Widowed/Separated	6	17.7	5	14.7	11	16.2	
Family History of Hypertension	No	16	47.1	14	41.2	30	44.1	.625 ²
	Yes	18	52.9	20	58.8	38	55.9	
Body Mass Index	Under Weight	2	5.9	0	0	2	2.9	.125 ²
	Normal	6	17.6	6	17.6	12	17.6	
	Overweight	2	5.9	8	23.5	10	14.7	
	Pre-obese	16	47.1	10	29.4	26	38.2	
	Obesity	8	23.5	10	29.4	18	26.5	

¹ p-value by Fisher's Exact test

² p-value by Chi-Square test

Table 2 Comparison of SBP and DBP between intervention and control group at baseline

Outcome Measure	Mean (SD)		t-test		Mean Difference	95% Confidence Interval of the Difference	
	Control Group	Intervention Group	t	p-value		Lower	Upper
SBP	147.06 (5.33)	148.38 (5.16)	-1.04	.30	-1.32	-3.86	1.22
DBP	93.7353 (2.22)	93.97 (3.01)	-.37	.72	.24	-1.52	1.05

At 3 months, the SBP of intervention group (131.04 mmHg) seems to be a lot less than the SBP of control group (141.84 mmHg). At 6 months, the SBP of the intervention group (130.87 mmHg) is still less than

the control group (134.17 mmHg), but not as much as at 3 months. The DBP of both groups seem to be not so different at 3 months and 6 months (Table 3).

Table 3 Comparison of SBP and DBP between intervention and control group at baseline, 3 months and 6 months

Variables	Mean $\pm$ SD											
	Control Group						Intervention Group					
	Baseline	3 Months	6 Months	Baseline	3 Months	6 Months	Baseline	3 Months	6 Months	Baseline	3 Months	6 Months
SBP	147.06 5.33	$\pm$ 141.84 $\pm$ 12.73	$\pm$ 134.17 $\pm$ 9.75	148.38 5.16	$\pm$ 131.04 $\pm$ 10.71	$\pm$ 130.87 $\pm$ 10.32						
DBP	93.74 2.22	$\pm$ 82.44 $\pm$ 8.86	$\pm$ 80.65 $\pm$ 6.81	93.97 3.01	$\pm$ 80.54 $\pm$ 7.10	$\pm$ 78.67 $\pm$ 7.19						

After intervention, the RM-ANOVA is used to determine for statistically significant differences in SBP and DBP between the intervention and control group at baseline, 3 months and 6 months. For SBP, there is significant difference in overall SBP at 3

time-points ($P < .001$), and a significant interaction between time and group at 3 time-points ($P < .001$). For DBP, there is significant difference in overall DBP at 3 time-points ($P < .001$) (Table 4).

Table 4 One-Way Repeated-Measures ANOVA results for SBP and DBP among control and intervention group in the study (between and within-subject effects)

Outcome Measure	Source of Variance	Type III Sum of Squares	Degree of Freedom	Mean Square	F	p-value	Partial eta square
SBP	Group	924.38	1	924.38	7.76	.007	.11
	Time	8471.00	2	4235.50	57.42	<.001	.47
	Group x Time	1271.42	2	635.71	8.62	<.001	.12
DBP	Group	75.37	1	75.37	1.56	.217	.02
	Time	8103.75	2	4051.88	112.53	<.001	.63
	Group x Time	53.75	2	26.88	.75	.476	.01

Post-hoc tests were ran to confirm where the differences between the groups occurred. Since RM-ANOVA found significant interaction between time and group at 3 time-points for only SBP, only post-hoc tests for those outcomes are performed. For SBP, patients in both the intervention and control groups have significantly decreased their SBP at 6 months from baseline ($P < .001$). However, when looking deeper into the comparisons for each time-point pairs, from baseline to 3 months, SBP is significantly decreased for the intervention group ($P < .001$), but

not significantly in for the control group ($P = .070$). This means that the SBP in the intervention group decreases at a faster time-rate compared to that in the control group (since their SBP significantly decreases at baseline to 3 months). The mean differences in SBP of baseline-3 months and baseline-6 months for the intervention group (17.339 and 17.515 mmHg) are also greater compared to that in the control group (5.221 and 12.890 mmHg). At 3 months to 6 months, both groups have no significant decreases in SBP (Table 5).

Table 5 Pairwise comparison and mean difference of SBP between baseline, 3 months and 6 months within intervention and control group

Group	Time-point pairs	Mean Difference	Standard Error	p-value ^b	95% CI for Difference	
					Lower	Upper
Control	Baseline – 3 months	5.22	2.20	.070	-.32	10.76
	Baseline – 6 months	12.89*	2.02	.000	7.80	17.98
	3 months – 6 months	7.67	2.37	.008	1.69	13.64
Intervention	Baseline – 3 months	17.34*	2.14	.000	11.95	22.73
	Baseline – 6 months	17.52*	2.15	.000	12.10	22.93
	3 months – 6 months	.18	1.53	1.000	-3.69	4.04

* mean difference is significant at the .001 level

^b adjustment for multiple comparisons: Bonferroni

Discussion

Results from analysis suggests how the intervention may help patients improve their hypertension conditions (to be below 140/90 mmHg) at a faster rate. SBP in the intervention group tends to decrease at a faster rate in the intervention group compared to the control group. DBP decreased significantly, but at the same levels in both the control and intervention group. However, after 6 months, the mean DBP of both groups are around the realms of 80 mmHg, which is the ideal level for a normal, healthy individual. When examining these two statements, it appears apparent that if this is the case, then it would mean the intervention program does serve to help

decrease BP, both systolic and diastolic, but with SBP decreasing at a faster rate than when applying only standard medical care. Thus, these results tend to suggest that, looking at the overall trend, the ITIHEP has an effect in helping to decrease the BP of patients with uncontrolled hypertension.

Findings from this study seem to support claims from past researches that suggest how health education could be beneficial in instilling positive behaviours and eventually decreasing BP among hypertension patients.¹⁴⁻¹⁷ Results also correspond to other health education studies that focus more on the outcome of blood pressure.¹⁸⁻²⁰ A study by Daranee A. determining the effects of a health-education program on blood

pressure levels among uncontrolled hypertensive patients revealed similar results in finding SBP and DBP to significantly improve than before the intervention and compared to the control group.¹⁸ Study results also tend to back the success of the theory that drives the design of the intervention's contents and layouts- the Health Belief Model, a conceptual framework for understanding health behaviors which theorizes that health-seeking behaviors are influenced by a person's perception of the following four critical areas: perceived severity, perceived susceptibility, perceived barriers, and perceived benefits, to which the factor of "cues to action" would serve to activate that readiness, along with an additional factor of "self-efficacy".²¹ In the intervention's design process, all elements in the model are triggered to provoke improvements in knowledge, positive attitude, and health-seeking behaviors towards hypertension control, in turns to decrease BP.

The core strength of this study is in its design as an RCT, which prevents selection biases, since allocation of subjects into intervention and control groups was randomly allocated.

Limitation

Possibility of contamination when participants from different groups talk to each other outside. Longer period of study may yield different results, which may better represent long-term intervention effects.

Conclusions

To conclude, the study shows that the ITIHEP tends to be beneficial in helping patients with uncontrolled hypertension in improving their rate of

decrease in BP as compared to when receiving only standard medical care.

Recommendations

It is recommended that results and insights from this study be used to further develop more effective programs for future researches and real-world policy applications to aid patients with uncontrolled hypertension. For future studies, this study could be used as a benchmark, case study or baseline for similar intervention programs designed to help with other chronic diseases, such as diabetes mellitus. The program, when further developed, may be used in health centres and hospitals to aid uncontrolled hypertension patients.

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