

The Effects of ICT-based Public Health Center Mobile Health Care Project on Adult Health Risk Factors

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Abstract

Background/Objectives: This study uses a single group pretest-posttest design to identify the effects of ICT-based public health center mobile health care project on adult health risk factors.

Method/Statistical Analysis: The subjects of this study were 100 adults, over 19 years of age residing in the jurisdiction of the public health center of G city, who are not yet diagnosed with metabolic syndromes but have at least one kind of risk factors. The general characteristics of the subjects were analyzed by using the frequency and percentages, and the comparison and analysis before and after the program were analyzed by using t-tests.

Findings: Blood pressure decreased significantly, as the systolic blood pressure decreased from 141mmHg to 136mmHg and the diastolic blood pressure decreased from 87mmHg ($p < .001$) to 83mmHg ($p < .001$). Fasting blood sugar decreased significantly from 111mg/dL to 104mg/dL ($p < .001$). The waist circumference decreased significantly from 93.4cm to 92.4cm ($p < .001$). Although triglyceride decreased from 222.4mg/dL ($t = 18.2, p < .001$) to 193.6mg/dL ($t = 23.7, p < .001$), the difference was not significant ($p = .051$). HDL-cholesterol increased from 42.1mg/dL to 44.4mg/dL which showed significant differences ($p = .003$). As there were also significant results on the HDL-cholesterol, it was proved that the ICT-based public health center mobile health care project is highly effective on the adult health risk factors (blood pressure, fasting blood sugar, waist circumference and HDL-cholesterol).

Improvements/Applications: There should be improvements in health management habits through management in physical activities and nutrition for metabolic syndromes of adults that can lead to chronic diseases, and expand health promotion projects that use ICT as a prevention health care service.

Keywords: *Mobilehealth careproject, Metabolic syndromes, Healthrisk factor, ICT, Publichealthcenter.*

Introduction

The present society is consistently on the search for a solution to the increase of the national health care costs and the socioeconomic burden due to the aging population and the increase of chronic diseases^[1].

Due to the fourth Industrial Revolution and a rapid advancement of technology, the number of mobile service subscribers rapidly increased, and mobile health which integrates the mobile services is being focused as the new alternative to health management^[2-3]. Recently, there has been an increase in the focus for mobile health due to wide distribution of wireless connection and wearable smart devices and development of biosensor technology, leading to an active integration of ICT and medical instruments^[4]. 'Mobile Healthcare' or 'Mobile Health (mHealth)' refers to medical and public health work supported by mobile devices^[5]. Mobile healthcare has been receiving even more attention as there are active integration of ICT and medical devices with the

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development of wireless connection and wearable smart devices, and the miniaturization and high density integration of biosensors^[6]. According to a report from the EC (European Commission), the major implementation factor of mobile healthcare is reducing medical costs for developed countries and increase accessibility to basic healthcare for developing countries^[7-8].

According to a recent study on the rate of metabolic syndromes of Korean adults, it was shown that 20.3% of the adults, or one out of five adults, had metabolic syndromes, which resulted in a need to prevent the metabolic syndromes^[9]. Metabolic syndromes are groups of physiological, biochemical, clinical and metabolic factors that are mutually related that increase the direct risks of all death factors such as Type 2 Diabetes and cardiovascular diseases^[10]. There should be intervention programs or studies to improve the risk factors of metabolic syndromes that can lead to chronic diseases for adults and for the adults to have healthy diets, physical activities, quit smoking and reduce drinking^[11-13]. Lee and Kim^[14] studied the effects of an intelligent VR exercise-appropriate protocol on the biological health factors of chronic stroke patients, and Park et al^[15] studied the possible benefits of a comprehensive support on obesity management of elementary school students using mobile phones as a qualitative study on the aspect of program providers. In addition, in the study by Lee and Park^[16] that identified the effects of an increase in physical activities with mobile healthcare on the body composition and risk factors of metabolic syndromes of the office worker men, it was shown that there is a positive effect of the increase of physical activities with mobile healthcare on the change of the body composition and risk factors of metabolic syndromes of the office worker men. However, after systematically studying literature on the health behavior intervention and the theoretical inter-correlation, there were little cases of developing mobile intervention programs based on the behaviour theory^[17]. In addition, there needs to be various kinds of studies that identify the effects of the ICT-based public health center mobile health care projects on adult health risk factors.

Therefore this study aimed to identify the effects of the ICT-based public health center mobile health care projects on adult health risk factors.

Method

This study uses a single group pretest-posttest

design to identify the effects of ICT-based public health center mobile health care project on adult health risk factors [Figure 1].

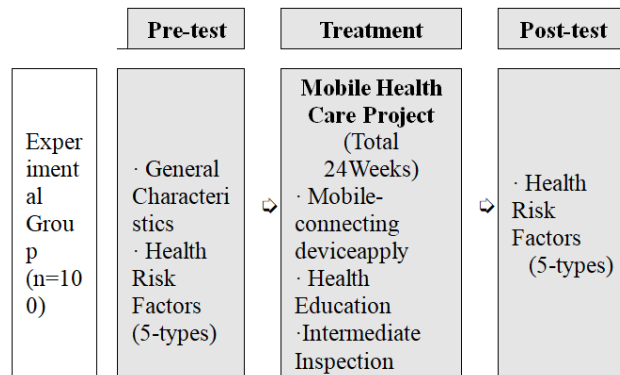


Figure 1. Design of Research

The subjects of this study were among the adults over 19 years of age residing in the jurisdiction of the public health center of G city, who are not yet diagnosed with metabolic syndromes but have at least one kind of risk factors out of the five health risk factors of the standards of metabolic syndromes according to the national health screening examinations^[18] who agreed to participate in this study. The adults who did not have prior experiences in participating in mobile health care projects were prioritized in selection; those who have developed into chronic diseases were excluded, and if there are too much new participants, those with higher numbers of health risk factors were selected in priority^[19-20]. The exclusion criteria were if data such as activity measurements were not transmitted during two weeks of the study, if the subjects lost the devices due to carelessness, if the risk factors have developed into chronic diseases during the course of the study and if the subjects were transferred to another jurisdiction, and a total of 100 subjects that match all criteria were selected for this study. The study started in February 2018 with selecting appropriate subjects to the selection criteria, and progressed on from May to October 2018 with the pre-test of the measured variables, the mobile health care project for 24 weeks (6 months) and the post-test after the project.

Starting from May 2018, the subjects were connected to a mobile application via Bluetooth and a mobile-connecting device such as activity measuring tools on their smart phones (at least Android 4.3, IOS 7.0), and for the 24 weeks (6 months) until October 2018, the subjects measured the number of walks, the walking time, walking distance, consumed calories, and real-time

heart rates which were sent to the mobile application and to the health center staff on the web. During the period, according to the results of health behaviors such as self-managing service, health information providing services, reciprocal health counseling services and continuous practice supporting services for the subjects based on a mobile application, it was possible to set health goals through counseling services such as quitting smoking and reducing drinking from nurses, nutrition counseling from nutritionists according to diet evaluation, physical activity counseling from physical activity instructors to induce sustainable customized health behaviors. Before and after (24 weeks) the mobile health care project, the study used surveys through the web to analyze the risk factors according to the subjects out of the five health risk factors (blood pressure, fasting blood sugar, waist circumference, triglyceride, HDL-cholesterol).

This study used SPSS Win 23.0 Program for the statistical analysis. The general characteristics of the subjects were analyzed by using the frequency and percentages, and the surveys through the web before and after the mobile health care projects (24 weeks) and the change and the analysis of the five health risk factors (blood pressure, fasting blood sugar, waist circumference, triglyceride, HDL-cholesterol) were analyzed by using t-tests.

Result and Discussion

1. General characteristics of the subjects: Out of the subjects of this study, 24% were aged between 30 and 39 (24 subjects), 33% were aged between 40 and 49 (33 subjects) and 36 were aged between

50 and 59. In terms of gender, 38 were males and 62 were females. In terms of the number of health risk factors, 24% of the subjects had one risk factor (24 subjects), 33% had 2 risk factors (33 subjects) and 43% (43 subjects) of the subjects had more than three, which was the highest proportion [Table 1].

Table 1. General characteristics of the subjects (N = 100)

Variables/Categories		n(%)
Years	20 years ~ 29 years	1(1.0)
	30 years ~ 39 years	24(24.0)
	40 years ~ 49 years	33(24.0)
	50 years ~ 59 years	36(36.0)
	60 years ~ 69 years	3(3.0)
	70 years <	3(3.0)
Gender	Male	38(38.0)
	Female	62(62.0)
Health risk factor	One	24(24.0)
	Two	33(33.0)
	Three≤	43(43.0)

2. Change and comparison in retention rate by Blood Pressure and Fasting Blood Sugar: [Table 2] After comparing the blood pressure before and after the mobile health care projects, both types of blood pressure decreased significantly, as the systolic blood pressure decreased from 141mmHg to 136mmHg and the diastolic blood pressure decreased from 87mmHg ($p<.001$) to 83mmHg ($p<.001$). Fasting blood sugar decreased significantly from 111mg/dL to 104mg/dL ($p<.001$).

Table 2. Change and comparison in retention rate by Blood Pressure (N = 100)

Variables	Group	Pre M±SD	Post M±SD	Difference M±SD	t	p
Blood Pressure (Systolic/ Diastolic) (mmHg)	Exp.(n = 100)	141/87±8.71	136/83±9.62	-5.03/-4.23 ±8.66/7.45	-4.56/-4.74	<.001
	t	135.58	118.40			
	p	<.001	<.001			
Fasting blood sugar(mg/dL)	Exp.(n = 100)	111±12.53	104±10.42	-6.63±7.04	-5.14	<.001
	t	48.45	54.78			
	p	<.001	<.001			

Exp.: Experimental group

3. Change and comparison in retention rate by Waist circumference, Triglyceride and HDL-cholesterol: [Table 3] The waist circumference decreased significantly from 93.4cm to 92.4cm ($p < .001$). Although triglyceride decreased from

222.4mg/dL ($t = 18.2, p < .001$) to 193.6mg/dL ($t = 23.7, p < .001$), the difference was not significant ($p = .051$). HDL-cholesterol increased from 42.1mg/dL to 44.4mg/dL which showed significant differences ($p = .003$).

Table 3. Change and comparison in retention rate by Blood Pressure (N = 100)

Variables	Group	Pre M±SD	Post M±SD	Difference M±SD	t	p
Waist circumference (cm)	Exp.(n = 100)	93.4±6.63	92.4±10.34	-2.10±2.96	-5.41	<.001
	t	107.36	68.62			
	p	<.001	<.001			
Triglyceride (mg/dL)	Exp.(n = 100)	222.4±93.02	193.6±59.97	-22.2±81.17	-1.99	.051
	t	18.21	23.72			
	p	<.001	<.001			
HDL-cholesterol (mg/dL)	Exp.(n = 100)	42.1±5.04	44.4±5.39	2.32±3.58	3.24	.003
	t	41.82	41.20			
	p	<.001	<.001			

Exp.: Experimental group

Discussion

This study was attempted to find out how the ICT-based mobile healthcare project affects health risk factors in adults with health risk factors according to the metabolic syndrome criteria in the national health examination results.

In this study, the subjects who participated in the mobile health care project were effective with blood pressure and fasting glucose. Similar to the results of this study, Kim et al.^[21] conducted a trial intervention to verify the short-term effects of the mobile application ‘NICE Health Ten’ on 68 adults in their 20s for 8 weeks, and fasting blood sugar, which had the highest screening rate, decreased from 16.2% to 4.4%.

In particular, as blood pressure and blood sugar are important health risk factors that can lead to chronic diseases, the subjects should focus on improving these factors with physical activities, managing nutrition and health and receiving counseling from experts. Although this study did not analyze the correlation of blood pressure and blood sugar with managing nutrition and health, there should be future studies to analyze the correlation. As well, the individuals with such risk factors should be continuously educated on self-managing the blood

pressure and blood sugar and should make sure that they do not lead to chronic diseases with additional education on quitting smoking and reducing drinking.

In addition, the subjects who participated in the mobile health project showed effective results in waist circumference and HDL-cholesterol. However, triglycerides did not show significant results. In a study by Kim^[21] to verify the short-term effects of the mobile application ‘NICE Health Ten’, triglyceride and HDL-cholesterol each decreased from 13.2% and 11.8% to 2.9%. Also, Chen et al.^[21] verified that the Internet-based health intervention program of eHealth for adults was effective for adults with one or more unnatural factors of the diagnosis standards of metabolic syndromes after providing individual feedback. Although this study did not show a significant result for triglyceride, as triglyceride is a major health risk factor that can lead to chronic diseases, those with problems in triglyceride should improve their levels with physical activities, managing nutrition and health and receiving counseling from experts.

Due to the rapid development of the mobile healthcare industry in Korea, there has been an increased interest in using mobile technology in the health promotion field

which is also rapidly developing. Although there are many studies that add mobile technology to the health management and intervention programs, there are still little studies that are based on theories or models. Therefore based on the results of this study, there should be future studies based on theories and models on the various mobile healthcare projects and intervention programs to prevent the metabolic syndromes of adults.

Conclusion

The purpose of this study was to identify the effects of ICT-based public health center mobile health care projects on the health risk factors of the adults. Through this study, it was proved that the ICT-based public health center mobile health care projects are highly effective on the adult health risk factors (blood pressure, fasting blood sugar, waist circumference and HD-cholesterol). Although there was no significant difference in the health risk factor of triglyceride, there should be future studies on the changes of health risk factors according to the changes in counseling to quit smoking and reduce drinking for nurses, practice rate of health behaviors and diet. In addition, there is a need of ICT-based health promotion projects as a preventive health care service through managing nutrition and physical activities for those with metabolic syndromes who are at risk for chronic diseases.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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