

Evaluation of Community-based Hypertension Control Programme in South Korea

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Abstract

Introduction: This study was conducted to provide an overview of the community-based hypertension and diabetes control programme of 19 cities in Korea and to evaluate its effectiveness in controlling hypertension at the community level. **Materials and Methods:** In this longitudinal observational study, we analysed the data of 117,264 hypertensive patients aged ≥ 65 years old from the time of their first enrolment in July 2012 to October 2013 (up to their 2-year follow-up). **Results:** The hypertension control rate of 72.5% at the time of enrolment increased to 81.3% and 82.4% at 1 and 2 years after enrolment. Treatment continuity, completion of hypertension self-management education, and longer enrolment duration in the programme contributed to improvements in hypertension control rate. **Conclusion:** This programme was characterised by a public health-clinical partnership at the community level. Despite its simplicity, the programme was evaluated as a successful attempt to control hypertension among patients aged >65 years at the community level.

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Key words: Health education, Participatory research, Public health-clinical partnership

Introduction

Hypertension is the most common risk factor for all cardiovascular diseases. The World Health Organization (WHO) defined hypertension as a major risk factor for coronary artery and cerebrovascular diseases.¹ In Korea, the prevalence rate of hypertension was 29.1% in 2016. The number of hypertensive patients is expected to increase again in the future due to the ageing population of Korea.² Deaths caused by cardio-cerebrovascular diseases accounted for 21.6% of deaths in Korea in 2016—approximately half of this (49.3%) was caused by cardiac diseases, 38.8% was due to cerebrovascular diseases and the rest (8.9%) was due to hypertensive disease.³ Additionally, these diseases have caused heavy financial burden for the country. For example, in 2008,

the overall healthcare costs amounted to US\$10 billion: cerebrovascular diseases (US\$4.5 billion); hypertensive heart diseases (US\$3.5 billion); ischaemic heart diseases (US\$2.1 billion); inflammatory heart diseases (US\$150 million); and rheumatic heart diseases (US\$65 million).⁴

In 2006, the Korean government initiated a comprehensive plan to control the cardio-cerebrovascular disease cases in the country. As part of the plan, the community-based hypertension and diabetes control programme was implemented in 2009 to encourage patients to continue receiving relevant treatments and improve their behaviours toward these diseases.⁵ This study describes the characteristics of the hypertension control system run by the programme and shows the effectiveness of the programme in controlling hypertension in the Korean context.

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Materials and Methods

Characteristics of the Community-based Hypertension Control Programme

To improve hypertension control at the community level, the programme aims to encourage behavioural change and continue hypertension treatment among participants. In line with this programme, the government established Hypertension/Diabetes Registration and Education Centers (HDRECs) in 19 cities. The steering committee of the centre is composed of public health officials, primary care physicians, pharmacists, and community leaders. Each centre manages the patient enrolment, provides education to encourage behavioural change and information on the disease, and reminds enrollees of the available services (Fig. 1).

Patients aged ≥ 30 years who visited the local clinics for hypertension treatment or were newly diagnosed with hypertension were advised to participate in the programme. Older patients (≥ 65 years) enrolled in the programme were eligible to receive financial incentives (discount on their medical expenses) of as much as US\$3 per visit for a month. The designated clinics also received an additional payment of US\$1-5 per patient per year from the government for their consistent efforts to register and provide education to the patients.

The regional HDRECs provide 8 hours of education on the control of hypertension and diabetes to new enrollees. This education provides patients with information on how to adopt a healthier lifestyle and to take one's medications properly. Furthermore, the primary care physician of the clinic registers patients who are newly diagnosed with hypertension and diabetes aged ≥ 30 years to the system. Moreover, the nurses, dietitians and exercise therapists

who work in the regional centres provide professional periodical counselling on how to control hypertension. Each regional centre runs a call centre as well. The call centre agents counsel patients and remind them to make regular appointments with their doctors via text messages or telephone calls. This provision of information to patients is supported by an information system run by the Korea Centers for Disease Control and Prevention (KCDC), which sends automated text messages reminding patients enrolled in the programme to visit their doctors.

The characteristics of this system can be summarised as follows: 1) Medical approach: To encourage continued treatment, the programme provides incentives for enrollees and reminds them of their periodic visits to the doctor; 2) Behavioural approach: Regional centres provide enrollees with education on how to improve their individual lifestyles; 3) Community-based approach: The system strives to improve public health by mobilising community resources, such as primary clinics, public health centres, healthcare professionals, and lay leaders; 4) Public-private partnership: The government cooperates with primary clinics and provides small monetary incentives for their participation in the programme; and 5) Simple system: Only a few elements (regional centres, information system, and financial incentives) were added to the existing healthcare delivery system.

After the initiation of the programme in 2009, the number of enrolled patients has continuously increased. As of 15 October 2015, this figure had reached 318,419 patients from 19 cities. At the time, the number corresponded to 32.9% of all patients with hypertension or diabetes. The budget of the programme was set at US\$13.4 million for 2016, half

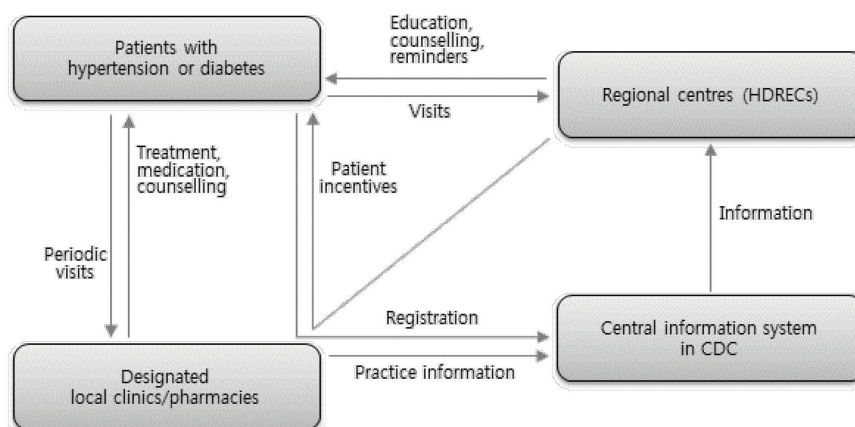


Fig. 1. Elements of the Hypertension/Diabetes Registration and Control Program in Korea. CDC: Centers for Disease Control and Prevention; HDRECs: Hypertension/Diabetes Registration and Education Centers.

of which was to be provided by the central government and the other half by the local governments participating in the programme.⁶

Data Source and Participants

We used the patient information from the central information system at the KCDC. Inputting of the blood pressure information of hypertensive patients into the central information system was mandated starting in July 2012. However, the blood pressure information of patients aged 30–64 years old participating in the study was incomplete because they were not eligible to receive financial incentives. To evaluate the effectiveness of this programme, the participants were chosen among hypertensive patients aged ≥ 65 years (with financial incentives), who had newly participated in the registration control programme from July 2012 to October 2013, and had been enrolled in the programme for over 6 months. Subsequently, these participants were followed-up for 2 years. The final number of participants included in the analysis was 117,264 and at 2 years and the post registration number was 97,680 (Fig. 2 and Table 1).

For these participants, the total data-points for patients who had information on blood pressure was 426,842 and the missing rate of blood pressure information was 0.27%. This study was approved by the Institutional Review Board of the Soonchunhyang University (Reg. no. 201604-BM-013-01).

Definitions of the Study Variables

'Hypertension control' was defined as <140 mmHg systolic blood pressure (BP) and <90 mmHg diastolic BP. The 'continued-treatment rate' was calculated as follows:

Table 1. General Characteristics of the Study Participants based on the Registration Control Period

Characteristic	At-Registration	6 Months	1 Year	2 Years
No. of participants	117,264	108,372	104,694	97,680
Age (mean $\pm$ SD)	73.0 $\pm$ 6.1	73.7 $\pm$ 6.1	73.9 $\pm$ 6.0	74.6 $\pm$ 5.9
Male sex (%)	36.0	36.1	35.9	35.7
Education experience (%)	0.3	4.3	8.0	13.6
Treatment continuity (%)				
>90%	43.6	47.2	47.6	46.9
80% – 90%	21.0	22.6	22.3	21.6
<80%	35.4	33.2	30.1	31.5
Control rate (%)	72.5	76.0	81.3	82.4

SD: Standard deviation

(number of visits/total registration period [month]) $\times$ 100. 'Education completion' was determined based on whether the patient completed 8 hours of hypertension self-management education conducted by the HDRECs. The registration control period was divided into at-registration point, 6 months, 1 year, and 2 years (if the patient's blood pressure information at a certain period was missing, then it was replaced with the nearest value out of all measured data taken within a month).

Data Analysis

All analyses were conducted using STATA version 14.0 (StataCorp LLC, College Station, TX, USA). The general characteristics of the registered patients based on the registration control periods are presented as mean $\pm$ standard

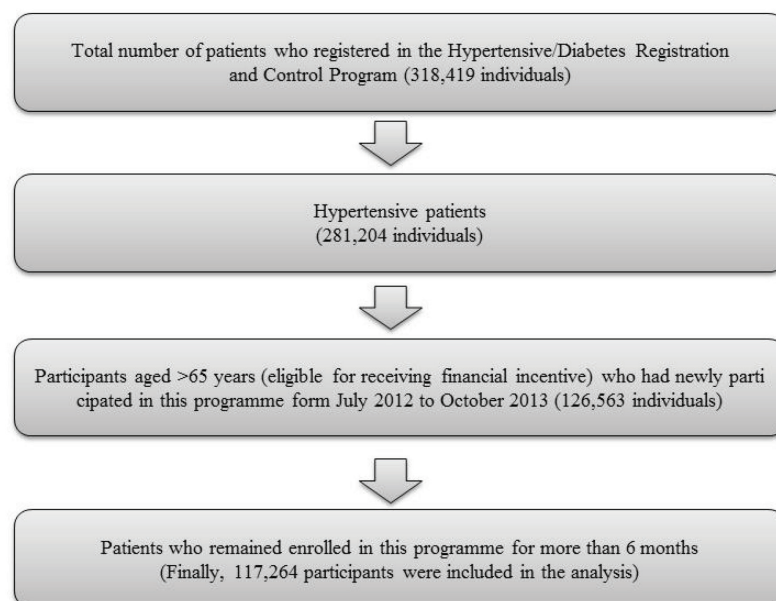


Fig. 2. Chart showing the number of participations included in the analysis from the programme.

deviation (SD) or percent. To identify the factors affecting hypertension control, the generalised estimating equation (GEE) models were applied by considering the clustering effects of the same patient pools and correlation of the repeat measures. The covariates included in this model were gender, completion of hypertension self-management education from the HDRECs, continued-treatment rate, and registration control period. Completion of hypertension self-management education was treated as a time-varying covariate for ‘before’ versus ‘after’ the completion of education.

Results

The total number of enrolled hypertensive patients between July 2012 and October 2013 was 117,264. Of these patients, 108,372, 104,694 and 97,680 were followed-up at 6, 12, and 24 months, respectively. The mean age of the 117,264 participants was 73.0 years (SD, 6.1), with men accounting for 36% of the overall number of patients. During the study period, 12.5% (14,677) of the total participants completed the 8-hour hypertension self-management education conducted by the HDRECs. Of the total number of patients enrolled, 43.6% and 21% had >90% and 80-90% continued-treatment rates. Meanwhile, <80% continued-treatment rate was reported for 35.4% of the total participants. The hypertension control rates among participants changed depending on the registration control period. For example, the hypertension control rate was 72.5% at the point-of-registration, which increased by 8.8% (81.3%) and 9.9% (82.4%) by the first and second year of registration control, respectively, compared with the point-of-registration. This finding showed an increasing trend for hypertension control rate after the enrolment of the patients to the programme (Table 1). When we analysed our data matching a patient retrospectively (based on 2 year, 1 year and 6 months, respectively), there were no big difference in the hypertension control rate at-registration between the remained-group at 2 years after registration, and the group-at-registration (73% vs 72.5%). And the result of McNemar’s test for paired data showed that there were significant difference in hypertension control rate between at-registration and each observed periods ($P < 0.001$) (Table 2).

We found that men experienced more difficulty in controlling hypertension than women (odds ratio [OR], 0.85; 95% confidence interval [CI], 0.84-0.87). Additionally, completion of hypertension self-management education provided by the HDRECs was proven effective in controlling hypertension (OR, 1.18; 95% CI, 1.14-1.23). Compared with the OR of patients whose continued-treatment rate was >90%, the ORs of those with continued-treatment rates of 80-90% and <80% were 0.91 (95% CI, 0.89-0.93) and 0.82 (95% CI, 0.81-0.84), respectively for hypertension control. Therefore, this finding suggests that the increase in continued-treatment rate is an important aspect in controlling hypertension. Moreover, compared with the OR of the point-of-registration, the ORs of the periods after 6 months, 1 year, and 2 years were 1.18 (95% CI, 1.16-1.20), 1.62 (95% CI, 1.59-1.65), and 1.72 (95% CI, 1.69-1.75), respectively. This result indicates that the hypertension control rate increased as the patient stayed longer in the programme and that the registration programme was effective in controlling hypertension (Table 3).

Discussion

This paper describes a national programme aimed at controlling hypertension in Korea. Considering that hypertension and diabetes are challenging issues for public health worldwide, many countries implemented diverse forms of national programmes, such as the National Diabetes Prevention Program (DPP) in the United States,⁷ Disease Management Programme (DMP) in Germany,⁸ and North Karelia Project in Finland.⁹ The United States’ National DPP is a partnership between public and private organisations, including the country’s Centers for Disease Control and Prevention, community organisations, private insurers, employers, healthcare organisations, faith-based organisations, and government agencies, and the cost incurred by the programme is paid by private insurers and employers.¹⁰ Meanwhile, Germany’s DMP is a patient registration programme, where doctors provide continued medical treatment and education. When a doctor registers a patient in the programme, the doctor receives an incentive payment of 100 euros for the registration and another additional incentive payment for providing relevant

Table 2. The Result of McNemar’s Test for Hypertension Control Rate

Registration Period	No. of Patients	Hypertension Control Rate (%)				P Value*
		At-Registration	6 Months	1 Year	2 Years	
At-registration	117,264	72.5				-
6 months	108,372	72.8	76.0			<0.001
1 year	104,694	72.8		81.3		<0.001
2 years	97,680	73.0			82.4	<0.001

*McNemar’s test for paired nominal data.

Table 3. Multivariate Generalised Estimating Equation Models Used to Predict Hypertension Control among Hypertensive Patients who Participated in the Hypertension/Diabetes Registration and Control Programme

Variable	Odds Ratio	95% Confidence Interval	P Value
Sex (male vs female)	0.85	0.84 – 0.87	<0.001
Education experience (yes vs no)	1.18	1.14 – 1.23	<0.001
Treatment continuity (vs >90%)			
80% – 90%	0.91	0.89 – 0.93	<0.001
<80%	0.82	0.81 – 0.84	<0.001
Enrolment duration (vs at-registration)			
6 months	1.18	1.16 – 1.20	<0.001
1 year	1.62	1.59 – 1.65	<0.001
2 years	1.72	1.69 – 1.75	<0.001

education. As part of the programme, the patients receive diverse services, such as medical consultations (once every 3 months), health checks, blood tests, education, and evidence-based treatments. This programme was evaluated as successful in reducing mortality rates, decreasing disease complications, and lowering healthcare costs.¹¹

Meanwhile, similar programmes in Germany and Australia have focused on paying apt incentives to primary care physicians to manage and encourage patients to take proper medications and seek treatment.^{12,13} Registration and providing education and information, including telephone call reminders, are the common components of chronic care programmes in most countries.⁸

Korea's programme for hypertension and diabetes control, which was investigated in this study, is composed of elements also commonly used in other countries. The programme tried to adopt medical, behavioural, and community-based approaches at once, and the task was made possible by establishing regional centres (HDRECs) in addition to the existing healthcare delivery system. Successful public health-clinical partnership enabled the simple system to work properly because the clinics prevalent in communities were the core resources for the success of this strategy. Upon the examination of the effectiveness of the programme on hypertension control, the duration of staying enrolled in the programme was found to be related to improved hypertension control (which increased by 9.9% [82.4%] by the second year of the registration control). This result can be understood in the same context as that of a previous study, which examined this programme by comparing the enrollees with non-participants.¹⁴ In the multivariate analysis using GEE models (Table 3), the effectiveness of the programme proved to be positively affected by treatment continuity, education experience, and enrolment duration. Although treatment continuity and education experience could have been related to enrolment duration, each of the 3 factors significantly affected the hypertension control rates given

that their relationships were considered in the multivariate analysis. The effect of medical treatment continuity among the enrollees could be related to the financial incentive and the fact that the enrolled patients themselves chose their clinics for their healthcare needs, which allowed them not to change their doctors for trivial reasons. Many studies showed that patients who visited the same primary care physician consistently obtained a better treatment result than those who visited different primary care physicians.¹⁵⁻¹⁷ Education was also found to be effective in controlling hypertension in this programme, as also shown in many previous studies.^{18,19} However, only a small group (12.5%) of the enrolled patients received the education that this programme delivered. The institute (HDRECs) that can deliver the 8-hour standardised education programme was only at 19 places. The number of patients who participated in the education programme was 10–20 persons/time. And each centre delivered the programme 1–2 times/week. So, we thought that 19 HDRECs couldn't give enough opportunity of education due to the limitation of manpower, facilities and lack of publicity. Thus, increasing the number of patients receiving education is a pressing matter for this programme.

A previous study on this programme showed that patients who were enrolled longer in the programme more consistently adhered to their drug regimens than those who were enrolled for shorter periods, with the medication continuity rate increasing from 47.3% to 65.9% and 69.3% at 1 and 2 years, respectively after registration in the programme.⁶ This result indicated that enrolment duration functioned via the medical treatment continuity. In this study, the effect of enrolment duration remained statistically significant even after considering the effects of treatment continuity and education experience. This finding means that some positive factors related to enrolment duration were present but were not analysed in this study. These factors might be counselling along with education, strengthened doctor-patient rapport, supportive environment for self-

care, and so forth, which are provided to the patients upon enrolment to the programme. Research on determining these additional factors may help improve the efficacy of this programme to obtain better results than the current one.

Conclusion

The hypertension control rate (72%) among hypertensive patients aged >65 years with treatment based on the Sixth Korea National Health and Nutrition Examination Survey (2013-2015)²⁰ was highly similar to the rate at the time of registration to this programme (72.5%). The rate increased by almost 10% (82.4%) 2 years after enrolment in the programme. The results of this study showed that the programme was successful in controlling hypertension among patients aged >65 years at the community level. However, this study has some limitations to consider. First, we could not fully exclude the possibility that the improvement in hypertension control might be attributed to the fact that patients who remained longer in the programme had better self-efficacy than those who were enrolled for shorter periods, accounting for 83.3% of the follow-up rate. But as mentioned above (Table 2), we thought that the follow-up loss didn't make a significant impact on our results. Second, this study did not include a control group because of the nature of its design. Therefore, we need to perform an additional study to evaluate the effect of this programme by analysing the hypertension control rate in communities that did and did not implement the programme.

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