Nursing Studies and Practice International

Research Article
Published: 26 Jun, 2020

Two-Year Rural Community-Based Health Promotion Program to Develop Healthy Behaviors toward Dementia Prevention

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Abstract

In order to encourage rural community members to adopt healthy lifestyles to reduce the risk of dementia, the present study implemented twice short-course health promotion programs from 2018 to 2019. The studies of 192 subjects were sampled from six places. The subjects received regular cognitive function screenings and annual healthy lifestyle surveys. The 10-week courses consisted of five components: Exercise, nutrition, cognitive training, medical & family support, and stress relief. The study results showed significant differences in three health behaviors between two groups from 2018 to 2019: Active participation in learning activities, consumption of a Mediterranean diet, and weight control management. This study showed that rural elderly who engaged in the regular learning curriculum, established healthy lifestyle and managed chronic diseases could maintain a well cognitive status (MMSE: 26.04~27.18). The sustainable implementation of a health promotion program for dementia prevention can effectively help the public to cultivate a healthy lifestyle and maintain better cognitive function.

Keywords: Dementia; Health promotion; Health education; Community health

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Received Date: *05 Jun 2020*
Accepted Date: *19 Jun 2020*
Published Date: *26 Jun 2020*

Citation:
Chang L, Liao L-L, Liou Y-W, Yang C-Y. Two-Year Rural Community-Based Health Promotion Program to Develop Healthy Behaviors toward Dementia Prevention. Nurs Stud Pract Int. 2020; 3(1): 1013.

Introduction

Global and local plans for dementia

The World Health Organization (1996) announced the 2017-2025 Global Action Plan on the Public Health Response to Dementia, which aims to improve the lives of people with dementia, their caregivers, and their families, while decreasing the impact of dementia on communities and countries. It provides a set of actions to achieve a world where dementia is prevented and people with dementia and their caregivers receive the care and support they need to live with meaning and dignity. Areas for action include increasing prioritization and awareness of dementia; reducing the risk of dementia; developing earlier diagnosis, treatment, and care for the patient; supporting caregivers of patients with dementia; strengthening health information systems for dementia; and increasing research and innovation [1].

The Ministry of Health and Welfare in Taiwan (2018) proposed a new version of the National Dementia Prevention Policy. Furthermore, it plans to complete 63 dementia-care centers and 368 community-service centers by 2020. It will build a diversified mental health care model with 1,000 accommodations for those with dementia, and will strengthen local government support for those with dementia and their caregivers.

Dementia's modifiable factors

There are many risk factors for dementia, including high blood pressure, diabetes, hyperlipidemia, obesity, smoking, low education, no exercise, and depression [2]. By eliminating or reducing these risk factors, people could reduce their risk of developing dementia by 25% [3]. Studies have found that physical activity (such as exercise and dancing) and cognitive activities (such as learning new things, reading books, and singing), along with a healthy diet, can prevent dementia; thus, they are referred to as protective factors [4-7].

In addition to prevention and treatment, early intervention is especially important for elderly

people belonging to high-risk groups. A random two-year clinical trial of the finger study in a Finnish Community allowed high-risk groups to receive dietary guidance, exercise, prescriptions, cognitive training, and medical counseling, which effectively reduced dementia and cognitive decline [8].

Community health development and the participatory approach

The community health development model is an approach to national health care utilized in Taiwan that consists of four key points, namely, voluntary participation of community members, mutual assistance and cooperation to solve the community's health problems, the process of self-empowerment, and the focus on the overall community [9]. Some scholars have suggested that the process of community health development should include (1) motivating individuals and community members to learn independently; (2) strengthening the capacity of community members; (3) prioritizing issues that members themselves consider important; and (4) creating a critical awareness of community members [10-12].

Methods

Design and sample

The study design was a longitudinal study through intervention courses and an annual community survey to estimate risk and modifiable lifestyle changes for dementia prevention. The "OpenEpi" analysis software was used to calculate the study sample size based on the incidence value (0.02%) and Relative Risk (RR=5), with a desired confidence level of 0.95, a power of 0.8, and p=0.05. The sample size purposed to be 47 people per group for a cohort study. The inclusion criteria for recruiting participants were over 50 years of age, no serious vision problems, and no hearing-impairments.

The study participants were conveniently sampled from five community activity centers and one primary health center. All participants received a consent form and explanation of the questionnaire administration process. The subjects engaging in the health promotion curriculums belonged to the experimental group. The subjects selected from the one primary health clinic belonged to the control group.

The dementia prevention courses of this study were based on the Finnish Community research recommendations [8] and included: Diet management, exercise prescription, cognitive training and medical counseling and other health management measures. Various community health centers were selected for 60 h of training over 10 weeks from April to June each year.

Dementia prevention & protection curriculum

The framework of the Dementia Prevention and Protection Curriculum comprised the following five major parts (Figure 1). The curriculum involved a total of 60 h of courses implemented during a 10-week period.

A. Medical and social support: Introduction of dementia and Alzheimer's disease, oral health, safety on medicine use, falling prevention, Chinese medicine for dementia prevention, social support for dementia caregivers, and volunteer empowerment (7 h).

B. Stress relief: Musical therapy, laughter yoga, Chinese tea time, artificial intelligence pet (6 h).

C. Cognitive training: Arts and crafts, board games, network application (11 h).

D. Healthy diet: Health education on nutrition and cooking practice (20 h).

E. Elderly physical activity: Health fitness, pre-post fitness exam, and elderly aerobic exercise (16 h).

Measures

The research tools used were the Mini-Mental State Examination (MMSE) and a self-developed questionnaire on lifestyle behavioral measurement based on the Transtheoretical Model [13,14]. The measured behavioral variables were including cognitive learning behavior, regular exercise, Mediterranean diet, social participation, stress relief, weight control, etc.

The questionnaire design process adopted an expert content validity verification. The Content Validity Index (CVI) value reached 0.75 and the reliability had a Cronbach's α of 0.73. Further, this study used the MMSE questionnaire, for which the test-retest reliability was 0.08 to 0.95 [15,16] and with an acceptable sensitivity and specificity [17].

Analytical strategy

The SPSS (18.0) statistical tool was used for quantitative data analysis, statistical methods included descriptive statistic, and Generalized Linear Model (GLM) and Generalized Estimating Equation (GEE) were used for inferential statistical analysis.

Results

Demographic characteristics

In this study, 121 participants were engaged in the 2018 study (Table 1), 59 were placed in the experimental group, and 62 in the control group. In 2019, the number of new participants was reduced to 109, with 48 and 61 participants in the experimental and control groups, respectively. Regardless of the sample sizes, the proportion of women in the study group was higher than that of men, accounting for 50% to 70% of the population.

In terms of age distribution, compared to the 2018 trial, the age of participants in the experimental groups in 2019 increased by 6.7%. On the other hand, participants in the control groups decreased by 5.3%.

In terms of education, there were three levels: No education, primary school, and completion of junior/senior high school. In the study population, the ratio of uneducated participants in the experimental group between 2018 and 2019 decreased by 8.4%. In 2019, the experimental group increased by 15.3% of junior high school and above subjects, while the control group increased by 3.8%.

In terms of Body Mass Index (BMI), the proportion of BMI abnormalities (overweight) in the experimental group increased by 10.9% in two years, as it did for the control group of 10.8%. The health problem of overweight participants became more pronounced in the control group, moving up to 69% in 2019; also, the ratio of BMI in the control group was 10% higher than that in the experimental group.

In terms of health issues, the study subjects in 2019 were continually estimated for chronic diseases and risk factors, such as head collisions or smoking. Among them, hypertension was found to be one of the diseases with the highest rates of chronic disease, and the prevalence rate was as high as 52.5% in the control group.

The control group increased in the proportion who had arthritis, head trauma, and smoking behaviors. The experimental group

Table 1: Comparison of basic data between the 2018 and 2019 trials.

Year/Group n (%)	2018			2019		
	Experiment (n=59)	Control (n=62)	Difference (%)	experiment (n=48)	Control (n=61)	Difference (%)
Gender						
Male	19 (32%)	31 (50%)	-18%	13 (27%)	23 (38%)	-11%
Female	40 (68%)	31 (50%)	18%	35 (73%)	38 (62%)	11%
Age						
50-69ys	15 (25%)	15 (24%)	1%	9 (19%)	18 (30%)	-11%
>=70	44 (75%)	47 (76%)	-1%	39 (81%)	43 (70%)	11%
Education						
None	16 (27%)	19 (31%)	-4%	9 (19%)	21 (34%)	-15%
Primary	25 (42%)	23 (37%)	5%	17 (35%)	18 (30%)	5%
Secondary & Above	18 (31%)	20 (32%)	-1%	22 (46%)	22 (36%)	10%
BMI						
Underweight<18.5	3 (5%)	4 (6%)	-1%	3 (06%)	2 (3%)	3%
Ideal weight 18.5–24	28 (47%)	22 (35%)	12%	17 (35%)	17 (28%)	7%
Overweight >=24	28 (47%)	36 (58%)	-11%	28 (58%)	42 (69%)	-11%
Health problems						
Hypertension	22 (37%)	31 (50%)	-13%	22 (46%)	32 (52%)	-6%
Diabetes	13 (22%)	21 (34%)	-12%	9 (19%)	16 (26%)	-7%
Arthritis	7 (12%)	5 (8%)	4%	5 (10%)	9 (15%)	-5%
Heard Disease	6 (10%)	4 (6%)	4%	1 (2%)	2 (3%)	-1%
Chronic Kindness Disease (CKD)	0 (0%)	2 (3%)	-3%	4 (8%)	1 (2%)	6%
Head Injury	12 (24%)	9 (15%)	9%	10 (21%)	15 (25%)	-4%
Smoked Before	6 (10%)	4 (6%)	4%	2 (4%)	7 (11%)	-7%
MMSE						
MCI	13 (22%)	7 (11%)	11%	1 (2%)	5 (8%)	-6%

Table 2: MMSE estimate on subjects participating for two years (2018-2019).

MMSE Group	2018 Mean ± SE	2019 Mean ± SE
Experimental (n=18)	26.04 ± 1.08	27.18 ± 0.73
Control (n=20)	23.09 ± 0.78	23.48 ± 0.92

increased in the proportion who had hypertension and kidney disease. Regarding head injury, the study subjects reported that they either fell from trees during their childhood in rural areas, had accidents as rural laborers, or suffered from car accidents.

In this study, the MMSE questionnaire was used to evaluate the cognitive health status of the study participants, and the score was graded according to the educational level category. In the 2018 study, 13 (22%) of the experimental group displayed Mild Cognitive Impairment (MCI). In addition, in the 2018 control group, there were 7 people (11.3%) with MCI tendencies. In 2019, 38 participants continually engaged in the program, while 31 dropped off and 30 were newly enrolled. Only one participant (2.1%) had MCI status in the experimental group. In contrast, the control group had 5 participants (8.2%) with MCI status.

The cognitive function estimate (MMSE) for two-year participants

In this study, 38 people continually participated in the study from 2018 to 2019. According to the analysis results in (Table 2, Figure 2) regarding the difference in MMSE scores for these participants

Table 3: Comparing the stage of changes of cognitive learning behaviour between the 2018 and 2019 trials, within the experimental and control groups.

Parameter Estimates Variable	B	S.E	Wald χ^2	P value
Intercept	2.481	1.230	4.069	0.044*
Gender (Male *vs.* Female)	0.405	0.204	3.953	0.047*
AGE	-0.011	0.011	0.997	0.318
BMI	0.077	0.026	8.933	0.003**
Group (*Experiment. vs. Control.*)	0.980	0.268	13.371	<0.001***
Time (2019 *vs.* 2018)	-1.334	0.265	25.345	<0.001***
Group X Time	1.556	0.380	16.760	<0.001***

Note: $^{*}p \leq 0.05$; $^{**}p \leq 0.01$; $^{***}p \leq 0.001$

during the two years, experimental subjects increased from 26.04 to 27.18, which is an increase of 1.14 points; while control subjects increased from 23.09 to 23.48, an increase of 0.39 points.

The researchers used the GEE model to analyze the data and selected the ARI-correlation matrix tool to control the effect of time. The factors included: Experimental group, time point, age, gender, and education level, where the first two factors are the main effects and the last factor is the interaction effect. In the GEE statistical analysis, variables such as age, gender, and education level had been controlled. Furthermore, although the experimental group's score increased higher than that of the control group (β=0.755, Wald χ2=0.408, p=0.523), it still did not reach significant difference.

Figure 1: The framework of the dementia prevention and protection curriculum.

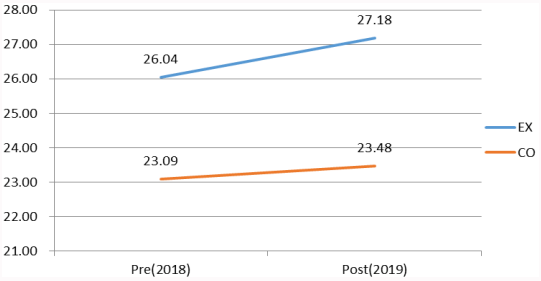

Figure 2: MMSE estimate for those who participated for two years.

Behavior changes for dementia prevention & protection - GLM analysis

Comparing the changes from 2018 to 2019, subjects in the control group (without participation in the health promotion course) showed heavy deterioration in the healthy lifestyle factors associated with dementia prevention. Among them, active learning, participation in social activities, consumption of a Mediterranean diet, and methods of stress relief declined year by year; only exercise habits were maintained at a certain ratio.

However, the experimental group (with participation in the health promotion program) had significant growth in active learning, physical activity, participation in social activities, and consumption of a Mediterranean diet, among which the Mediterranean diet had the greatest difference on healthy behavioral change. In terms of the behavior of relief, 30% of subjects expressed a without-distress status; therefore they did not adopt relief behaviors.

Based on the Transtheoretical Model to measure healthy behavioral change, as seen in Figure 3, the stages of change were

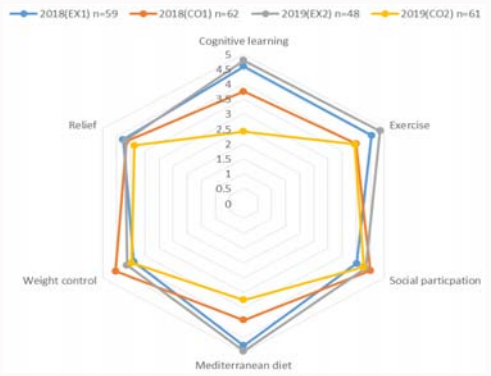

Figure 3: Behavior change of study subjects toward dementia prevention (2018-2019).

Table 4: Comparing the stage of changes of Mediterranean diet between the 2018 and 2019 trials, within the experimental and control groups.

Parameter Estimates Variable	B	S.E	Wald χ^2	P value
Intercept	4.322	1.215	12.658	<0.001***
Gender (Male *vs.* Female)	0.081	0.201	0.161	0.688
AGE	-0.014	0.011	1.546	0.214
BMI	0.024	0.025	0.869	0.351
Group (*experiment. vs. Control.*)	0.891	0.265	11.349	0.001***
Time (2019 *vs.* 2018)	-0.714	0.262	7.455	0.006**
Group X Time	0.914	0.376	5.897	0.015*

Note: *$p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Table 5: Comparing the stage of changes of weight Control between the 2018 and 2019 trials, within the experimental and control groups.

Parameter Estimates Variable	B	S.E	Wald χ^2	P value
Intercept	6.942	1.285	29.179	<0.001***
Gender (Male *vs.* Female)	-0.329	0.214	2.359	0.125
AGE	0.011	0.012	0.873	0.350
BMI	-0.123	0.027	20.530	<0.001***
Group (*experiment. vs. Control.*)	-0.770	0.277	7.712	0.005**
Time (2019 *vs.* 2018)	-0.550	0.275	3.998	0.046*
Group X Time	0.788	0.401	3.857	0.050*

Note: *$p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

stratified as pre-contemplation, contemplation, preparation, action, and maintenance. A statistical analysis of the GLM was used to compare the experimental group and the control group in terms of dementia protection behaviors between 2018 and 2019. There were significant differences in three healthy lifestyles (Tables 3-5), including active participation in cognitive learning behavior (β=1.56, p<0.001), consumption of a Mediterranean diet (β=0.91, p<0.05), and weight control (β=0.79, p < 0.05). However, for exercise habits (β= 0.34, p=0.35), social participation (β=0.56, p=0.17), and relief habits (β=0.28, p=0.55), the changes in the two groups were not significantly different.

Discussion

Health-lifestyle behaviors delay cognitive decline in the elderly

This study involved a two-year health promotion program. The participants consecutively engaged in these two-year programs, with their cognitive function improving in the second year from the first year. Although the experimental and control groups did not show significant differences in their MMSE scores over the two years, the subjects who participated in the two-year course continued to maintain a high cognitive function status, and their MMSE average scores (27.18) in the second year were much higher than that of the control group (23.48). This showed that active elderly, who engaged in the learning curriculum, established healthy diets and exercise habits, controlled their body weight, and managed chronic diseases maintained better cognitive status.

Obstacles to developing health behaviors against dementia

In this study, the subjects who were not enrolled in the health promotion courses showed a marked deterioration in their healthy lifestyles associated with dementia prevention. Among them, active learning, participation in social activities, consumption of a

Mediterranean diet, and relief methods were decreasing annually. However, the population with HP activities showed a significant growth of percentages in active learning, physical activity, participation in social activities, and consumption of a Mediterranean diet. For the behaviors of active learning, regular physical exercise, and social activities, 90% of the experimental group reached the "action and maintenance" stage of change. On the other hand, only 34.4% of the subjects in the control group regularly participated in learning activities [18].

Reported a longitudinal study results surveyed from 1995 to 2012 to determine whether cognitive impairment affects health behaviors. It showed that the cognitive impairment both with and without dementia were associated with a lower likelihood of engaging in regular vigorous physical activity. In this study, the main obstacle in implementing healthy behaviors in the control group was that they did not prefer to engage in social participation and rarely interacted with others. Compared to the experimental group, they had less access to new knowledge and lacked encouragement and support from partners.

Less healthy dietary patterns among the rural population

Most studies in Western countries have shown that healthy dietary patterns may have a protective effect against cognitive decline and dementia occurrences [5]. However, people from Eastern countries are less likely to comply with a Mediterranean or healthy diet, particularly the rural population. In this study, only 6.7% of experimental group increased their consumption of Mediterranean diet, which includes more fish, beans, nuts, brown rice, grain rice, fruits, and vegetables, and involves less of frying as a cooking method. In addition, in the control group, most people who are hypertensive and diabetic had regularly received nutrition instructions at the primary community health center; however, 18% of them still did not adopt a balanced diet. One study conducted by Okubo et al. [19] indicated that "plant foods and fish" have a beneficial effect on cognitive function; however, neither the "rice and miso soup" nor the "animal food" patterns were found to be related to cognitive function. Therefore, this study suggests that more research is needed to estimate which Eastern dietary patterns may be beneficial for cognitive function, and more likely to be followed by the rural community population [20,21].

The implications for community nursing

This study found that the cognitive learning activities and Mediterranean dietary habits of the control group decreased significantly annually. Secondly, in terms of social participation, stress relief, and weight control, it has also reduced the implementation of life compared to the previous year. In addition, exercise habits of the control group were significantly lower than that of the experimental group. The findings of this study have three important implications for community nursing:

1. Community health programs should expand participation and provide more people with opportunities to learn how to prevent dementia. First, using the mass media or environmental arrangements to provide a more convenient and interactive channel of health information or a platform for individual consultation to the elderly in rural areas, especially those with low education and illiteracy.

2. Due to the lack of human resources in rural areas, community nurses can cooperate with academic institutions and establish good partnerships. By utilizing the resources of academic institutions, absorbing more evidence-based research methods, and teaching the public to distinguish between correct and incorrect health information, the health literacy of rural people can be enhanced to delay dementia.

3. To encourage healthy diet habits and improve cognitive learning aspects, it is still necessary to cultivate volunteer leaders to establish community healthy associations. Community nurses may hold some entertaining competitions, such as cooking competitions or handicraft exhibitions, to strengthen cognitive learning. To encourage the public too regularly and actively participate in learning activities and avoid interruptions caused by end of government funding programs.

Limitations

The limitation of the study was not randomly sampling from the study subjects that might limit the application for other researches regarding the effectiveness of health promotion curriculums for dementia prevention.

Conclusion

This study found that sustainable implementation of a health promotion program for dementia prevention can effectively help the public to cultivate a healthy lifestyle and maintain better cognitive function. Government institutes should invest more resources to promote continuous health promotion and education courses in rural areas.

Community health nurses should cooperate with community resources, including academic professionals, medical institutions, civil society, and government resources, to design health promotion programs that are closer to the health demands of people.

Finally, further research is necessary on the use of a health behavior measurement scale to accurately estimate the health behaviors and lifestyles of people, as well as on developing innovative activity strategies to achieve the goal of prevention of dementia.

Acknowledgement

To acknowledge all research participants, research team members and the research funding (2018-2019) from National Tainan Junior College of Nursing.

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