

# Evaluating the Effectiveness of Community-Based Dementia Caregiver Intervention on Caregiving Burden, Depression, and Attitude Toward Dementia: A Quasi-experimental Study

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**Objective:** Accumulating evidence of the effects of dementia caregiving on individuals, society, and health has generated intervention studies to reduce the stress among family caregivers of people with dementia. This study aims to evaluate the effectiveness of a family support program, community-based dementia caregiver intervention (CDCI), among family caregivers of people with dementia compared with a control group (no intervention).

**Patients and Methods:** This study is a quasi-experimental, non-randomized controlled trial conducted in six dementia relief centers of a community healthcare center in Korea. Family caregivers of 83 patients with dementia were recruited; of these 78 were included in the final study, with 40 in the intervention group and 38 in the control group. Analysis of covariance (ANCOVA) was used to compare the mean difference in the scores of the total short-form Zarit Burden Interview (SZBI), personal strain, role strain, depression, and attitude between the groups.

**Results:** Compared with controls, in the intervention group, the adjusted mean score of personal strain ( $F = 4.353$ ,  $t = 0.041$ ) and attitude toward dementia ( $F = 10.284$ ,  $t = 0.002$ ) differed significantly after the intervention, with a small to moderate effect. There was no significant difference in the total SZBI, role strain, or depression mean score.

**Conclusion:** The findings suggest that CDCI may be an effective intervention strategy to reduce personal strain and enhance the attitudes of family caregivers of people with dementia.

**Keywords:** community-based intervention, caregiver burden, dementia, family support program, family caregiver

## Introduction

South Korea is among the most rapidly aging countries in the world.<sup>1</sup> In 2021, the proportion of the population aged 65 and above in Korea was 16.5%, and is expected to reach 37.0% in 2050, the second highest after Japan, among the Organization for Economic Cooperation and Development (OECD) countries.<sup>2,3</sup> The number of elderly people with dementia in Korea has increased rapidly over the past nine years, rising to 11.2% of the total population in 2019.<sup>4</sup> Dementia has physical, psychological, economic and social effects not only on individuals with dementia but also on family caregivers as well.<sup>5</sup> Specifically, caregivers of people with dementia have a greater burden than caregivers of people without dementia.<sup>6</sup> Additionally, caregivers of dementia are often referred to as invisible second patients<sup>7</sup> as the high psychological and physical demands of dementia care make family caregivers a vulnerable group.<sup>8</sup> Dementia caregivers are at risk of a compromised immune system,<sup>9</sup> a higher risk of developing anxiety and depression,<sup>10,11</sup> and

a higher risk of contracting cardiovascular diseases.<sup>12</sup> Moreover, caregivers of people with dementia are more prone to suffering high burden and burnout,<sup>13,14</sup> and are more likely to be obese and smokers.<sup>15</sup>

Therefore, it is important to support informal community-dwelling caregivers of people with dementia to reduce or prevent the psychological distress risk possible during the care process as early as possible.

Many interventions have been implemented and evaluated to support caregivers of people with dementia. A recent comprehensive systematic review of 280 controlled studies investigated the effectiveness of dementia caregiver interventions. Dementia caregiver interventions were divided into the following seven main categories: psychoeducational interventions, cognitive-behavioral therapy, counseling/case management, general support (eg, peer support), respite, training of the care recipient (eg, memory training), and multicomponent interventions.<sup>16</sup> It was concluded that dementia caregiver interventions were effective in improving burden, depression, ability/knowledge, subjective well-being, and the caregivers' anxiety and symptoms of the care recipient. Additionally, a systematic review was conducted in Korea to assess the effectiveness of Korean interventions for family caregivers of people with dementia.<sup>17</sup> This study included 23 other studies that involved recent randomized control trials (RCTs), non-RCTs, and observational designs without control group (one group pre- and post-test).<sup>17</sup> In this review, the most frequently evaluated outcome variable was "burden and depression." Further, out of 26 studies, there were 16 studies on burden, and 11 of these 16 showed statistically significant results. There were 10 of 26 studies on the "depression" variable, and eight of these 10 had statistically significant results. "Coping strategy" was reported in seven out of 26 studies and statistically significant results were found in four of these. "Quality of life" was reported in six out of 26 studies and statistically significant results were obtained in three of them. Meanwhile, the families of people with dementia in Korea did not use coping strategies appropriately when caring for people with dementia and depended on the social support system more, compared with caregivers in the United States.<sup>18</sup> Therefore, in Korea, it is more important to detect this burden on caregivers and intervene to ultimately protect both patients and caregivers from negative consequences and ensure adequate quality of life.

The World Health Organization (WHO) highlighted national intervention in dementia management by increasing the priority of dementia on the public health research agenda and highlighting the need to invest in health care systems to improve care for people with dementia and their caregivers.<sup>19</sup> In 2015, Korea announced the 3rd National Dementia Plan to reduce the socioeconomic and psychological burdens on families of people with dementia, and is making efforts to reinforce support care services at the national level.<sup>20</sup> Since 2017, the Korean government has been operating dementia relief centers in 256 public health centers across the country to implement a family support project. Specifically, the family support program operated by dementia relief centers aims to enhance the understanding of dementia and care for families of people with dementia, and improve their caring capabilities through a systematic and specific curriculum.<sup>21</sup> So far, studies on the effects of the dementia support center (Korean center name "dementia relief center") project include a study that confirmed the effect on the empowerment and dementia attitude of a dementia family after applying a family support program at one dementia relief center,<sup>22</sup> and another on the experience of care support in a dementia relief center for family caregivers.<sup>23</sup> Previous studies suggest that dementia family caregiver intervention can be important. However, the level of evidence in various system contexts should be improved. In particular, few studies have been conducted on the effectiveness of dementia support programs operating at the national level. Therefore, we designed a non-randomized controlled trial to assess the effectiveness of the family support program of community-based dementia caregiver intervention (CDCI). Based on the present evidence, this study attempted to evaluate the effects of CDCI for caregivers of people with dementia on care burden (personal strain and role strain), depressive symptoms, and attitudes toward dementia.

## Patients and Methods

### Study Design

This is a quasi-experimental study designed to investigate the effect of community-based interventions on caregivers of families with dementia. Because the community-based intervention is a national public health project, randomization is not available. Further, we chose a quasi-experimental study as it could not be applied to specific populations owing to

ethical concerns. Additionally, this design was considered a valid method to conduct research on caregiver program efficacy.<sup>24</sup> In this study, we included both an intervention and a control group, as described below.

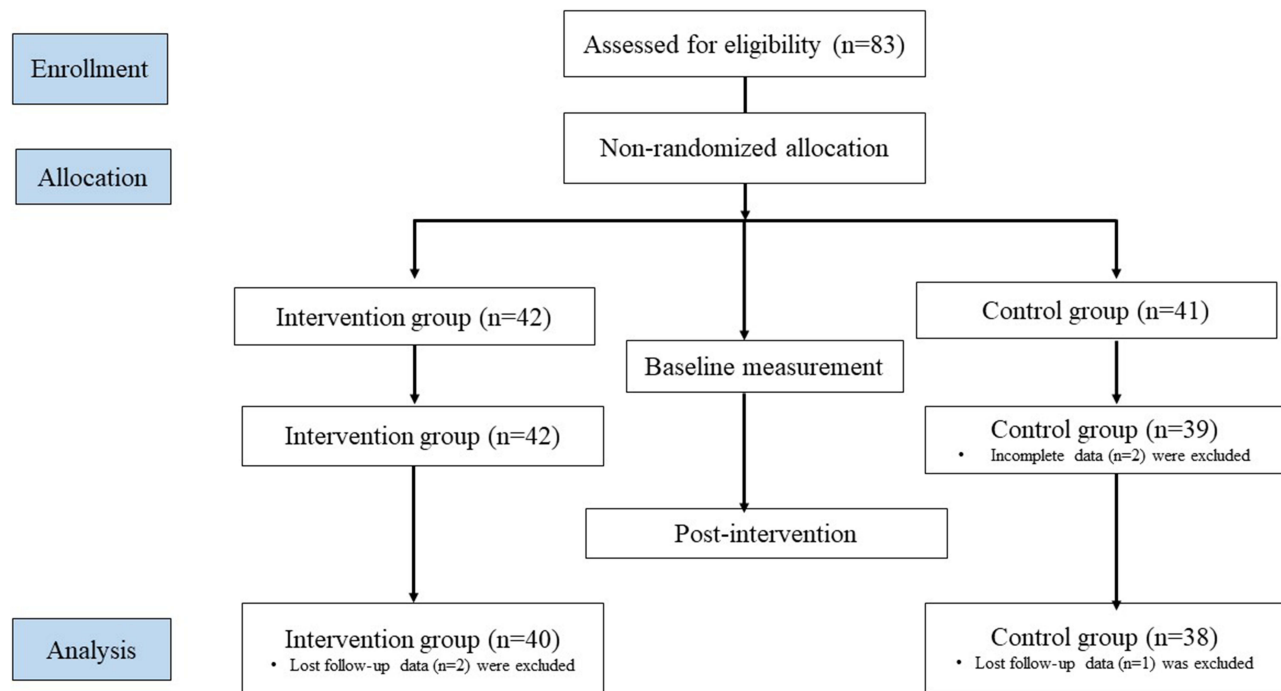
## Participants

### Intervention Group

In Korea, people with dementia were registered at the dementia relief centers of 256 community health centers and are managed by the government.<sup>25</sup> Adult family caregivers of registered people with dementia were recruited from five dementia relief centers for local autonomies in city A and one dementia relief center in city B, between September 2019 and December 2019. The inclusion criteria for participant enrollment necessitated (1) 18 years old or older and under 90 years old; (2) spouse, blood tie, or a caregiver who is related to a person with dementia; (3) the main caregiver of a person diagnosed with dementia at dementia relief centers; (4) when a caregiver provided care while living with people with dementia or provided care more than twice a week when not living together; (5) those who could communicate well without hearing problems. The exclusion criteria encompassed (1) formal paid caregivers who received special cash benefits from long-term care insurance; (2) caregivers of people with dementia currently in a long-term care facility; (3) those who have had suicidal thoughts or attempted suicide within the past five years of medical treatment, those with depression with psychotic features, and those with major psychiatric disorders (eg, schizophrenia). [Figure 1](#) shows the CONSORT flowchart of this study.

### Control Group

The control group was recruited from family caregivers of people with dementia who were using the visiting nursing service from long-term care facilities and hospitals, and who had not previously attended the family support program course at of dementia relief centers. Data were gathered by intervention staff (trained practitioners). In addition, we contacted the staff of the family support program and visiting nurses who provided visiting nursing service, explained the purpose of the study and method of data collection, and requested cooperation from the working practitioners. While the CDCI was provided to the intervention group for 8 weeks, controls continued in their usual care activities, such as



**Figure 1** Flowchart of participants.

individual caregiver support. At the end of the data collection, they were provided with related information on CDCI in dementia relief centers located in their residential areas.

## Procedures

Recruitment notices were posted to the relevant dementia relief centers, and the participants registered voluntarily. This study was approved by the Institutional Ethics Review Committee of Chosun University (IRB No. 2–1041055-AB-N-01-2019-09), and informed consent was obtained from all the participants. Data relating to caregiving burden, depressive symptoms, and attitude toward dementia were collected twice, in total, in the intervention and control groups: once before the intervention (baseline level) and again immediately after the intervention (eight weeks later).

## Intervention

### Public Community Health Center-Based Dementia Caregiver Intervention

The purpose of education and training interventions is to improve 1) knowledge on dementia (understanding dementia, psycho-behavioral symptoms, early symptoms of each type, risk factors, diagnosis, treatment, and management) and 2) the ability to care for people with dementia (understanding theirs and their families' feelings, helping with overcoming negative attitudes, teaching communication methods, finding the remaining abilities of patients with dementia, and promoting self-care for their families). Additionally, it includes information about dementia-related services and system-related information.

The program delivery method was collectively face-to-face at the dementia relief centers, and the intervention time was 1–1.5 hours per session, a total of eight sessions. Intervention providers were pre-trained doctors and nurses. Educational or printed materials were further distributed.

## Outcome Measures

### The Care Burden of Family Caregivers

The primary healthcare outcome was the care burden of family caregivers, and the short version of the Zarit Burden Interview (ZBI) scale, which evaluates the personal strain, and role strain of family caregivers was used as a measurement tool. The short ZBI burden scale comprises a 12-item 5-point scale (range 0–4), with a total of 48 points, with 36 points for personal strain and 12 points for role strain.<sup>26,27</sup> The personal strain comprises items that evaluate the strain on the individual caregiver owing to the care behavior (eg, how stressful the experience is). The role strain comprises items that evaluate the burden of the caregiver while taking care of their patients (eg, stress owing to overload or conflict)<sup>28</sup> with a higher score indicating a greater burden.

### Depression

Depression symptoms, a secondary healthcare outcome, were evaluated using the Korean version of the Patient Health Questionnaire 9 (PHQ-9)<sup>29</sup> with a score ranging from 0 to 27 points (higher scores indicate increasing psychological stress). Scores of 0–4, 5–9, 10–14, 15–19, and 20–27 indicate no depressive symptoms, mild symptoms, moderate symptoms, moderate-to-severe symptoms, and severe depressive symptoms, respectively. The commonly used 10 was set as the cut-off point for depression screening.

### Attitude Toward Dementia

The Dementia Attitude Scale (DAS), which is a secondary healthcare outcome, was used to assess attitudes toward dementia. It is a 20-item measurement scale that encompasses knowledge on dementia and social comfort.<sup>30</sup> For each item, “strongly disagree” equaled one point and “strongly agree” equaled seven points, for a total of 140 points. Six of these items were counted inversely, and a higher score indicated a positive attitude toward dementia.

## Statistical Analyses

In the power analysis of the G-Power 3.1 program, when the effect size ( $f$ ) is 0.40 (large effect), the number of groups is 2, the degree of freedom is 1 ( $=2-1$ ), the covariates are 6, the number of samples calculated at the condition of significance level ( $\alpha$ ) is 0.05 and power ( $1-\beta$ ) of 0.80. A total of 114 ( $n_1 = n_2 = 57$ ) samples were needed, considering

a dropout rate of 10%. However, 83 samples were actually recruited, and this sample size had a power of approximately 0.7, meaning that the probability of making a Type 2 error was higher. Excluding participants who dropped out, 40 participants in the intervention group and 38 participants in the control group were analyzed using the per-protocol (PP) method (comparison of intervention groups that included only participants who completed the originally allocated intervention).

Raw data were coded and entered into the SPSS version 25 software for statistical analysis. Descriptive statistics such as number, percentage, and mean and standard deviation were used to suggest the general characteristics related to dementia family caregivers of the intervention and control groups, and the level of care burden, depression, and attitude toward dementia. The two-group homogeneity test for baseline level before intervention was analyzed using the chi-squared test, Fisher's exact test, and independent two-sample *t*-test. To verify the hypotheses, one-way ANCOVA was performed to compare the post-intervention mean scores of care burden (total, personal strain, role strain), depression, and attitude toward dementia between groups, by adjusting the post-intervention mean scores with the baseline mean scores. Additionally, ANCOVA was performed to control not only demographic characteristics of participants but also the Charlson comorbidity index of participants<sup>31</sup> and dependence scale<sup>32,33</sup> of persons with dementia, to estimate the effectiveness of CDCI.

Statistical significance was determined using a two-sided *p*-value of less than 0.05. Additionally, to estimate the effect size (ES) of the intervention, the effect size (partial eta squared) was calculated using Cohen's ES, which indicated a small effect of 0.02, a moderate effect of 0.13, and a large effect of 0.26.<sup>34</sup>

## Results

Seventy-eight participants were included in the analysis, with 40 in the intervention group (post-intervention data were incomplete in 2 out of 42 samples) and 38 in the control group (among 42 recruited samples, pre-intervention data for two and post-intervention data for one sample were incomplete). Descriptive data for the intervention and control groups are presented in Table 1. Group differences in gender, education, home care services for long-term care insurance (LTCI), and sleep duration were not statistically significant (all  $p > 0.05$ ). However, there were significant differences in age ( $p < 0.001$ ), Charlson Comorbidity Index (CCI) ( $p = 0.002$ ), Dependence Scale (DS) score ( $p = 0.014$ ), living with the patient ( $p = 0.001$ ), number of caregivers ( $p < 0.001$ ), and work status ( $p = 0.006$ ).

Table 2 shows a comparison of the mean differences between the intervention and control groups. The mean PHQ-9 score in the intervention group decreased significantly after the intervention ( $t = 2.362$ ,  $p = 0.023$ ). Decreasing scores indicated a decrease in psychological stress. The paired *t*-test also indicated that the mean DAS score in the intervention group increased significantly after the intervention ( $t = -3.312$ ,  $p = 0.002$ ). The increased DAS scores indicated a positive attitude toward dementia. However, in the control group, the mean DAS score decreased significantly after the intervention ( $t = 4.542$ ,  $p < 0.001$ ).

The independent *t*-test showed that there was a significant difference in the mean score of the short-form Zarit Burden Interview (SZBI) total between the intervention (mean = 25.53) and control groups (mean = 18.0) in the pre-tOest ( $t = -4.064$ ,  $p < 0.001$ ) and the SZBI total between the intervention (mean = 25.13) and control groups (mean = 18.42) in the post-test ( $t = -3.483$ ,  $p = 0.001$ ). An independent *t*-test showed that there was a significant difference in the mean score of personal strain between the intervention (mean = 18.85) and control groups (mean = 11.03) in the pre-test ( $t = -4.921$ ,  $p < 0.001$ ) and the personal strain between the intervention (mean = 17.25) and control groups (mean = 12.47) in the post-test ( $t = -2.830$ ,  $p = 0.006$ ). However, there was a significant difference in the mean score of role strain between the intervention (mean = 7.88) and control (mean = 5.95) groups only in the post-test ( $t = -2.768$ ,  $p = 0.007$ ). Additionally, the independent *t*-test demonstrated that the difference was statistically significant in the mean DAS score between the intervention and control groups in the pre- and post-tests ( $t = 3.390$ ,  $p = 0.001$ ) ( $t = -2.664$ ,  $p = 0.009$ ). The attitude toward dementia in the pre-test control groups was better, but in the post-test intervention group, the attitude toward dementia was better.

Table 3 shows a comparison of the effect of CDCI on caregiver burden, depression, and attitude toward dementia. Age, CCI, DS score, living with the patient, number of caregivers, and work status were considered covariates when calculating the results, following the significant difference between the groups. Additionally, there was a significant difference in the mean SZBI (total and personal strain) and DAS scores between the two groups in the pre-test (Table 2), which was used to

**Table 1** Baseline Characteristics of Caregivers of People with Dementia Between the Groups (N = 78)

Demographics	Intervention Group (n = 40)	Control Group (n = 38)	t or $\chi^2$	P-value
	Mean $\pm$ SD or n (%)	Mean $\pm$ SD or n (%)		
Study Participants				
Gender				
Male	14 (35)	7 (18.4)	2.722	0.099
Female	26 (65)	31 (81.6)		
Age, (years)	72.28 $\pm$ 8.76	56.13 $\pm$ 12.51	-6.629	<0.001*
Education (years)	9.65 $\pm$ 3.9	9.94 $\pm$ 4.9	0.288	0.774
CCI				
0	8 (20)	21 (55.3)	12.973	0.002*
1	6 (15)	7 (18.4)		
2	26 (65)	10 (26.3)		
DS score	8.0 $\pm$ 2.8	9.68 $\pm$ 3.10	2.519	0.014*
Home Care Services of Long-term Care Insurance				
Yes	29 (72.5)	26 (68.4)	0.156	0.693
No	11 (27.5)	12 (31.6)		
Living with the patient				
Yes	36 (90.0)	21 (55.3)	11.952 <sup>a</sup>	0.001*
No	4 (10.0)	17 (44.7)		
Number of caregivers				
1	34 (85.0)	11 (28.9)	30.105 <sup>a</sup>	<0.001*
2	5 (12.5)	8 (21.1)		
3	0 (0)	9 (23.7)		
$\geq$ 4	1 (2.5)	10 (26.3)		
Sleep duration (hours)	6.80 $\pm$ 1.69	6.85 $\pm$ 1.01	0.143	0.887
Work Status				
Yes	9 (22.5)	20 (52.6)	7.575	0.006*
No	31 (77.5)	18 (47.4)		

Notes: <sup>a</sup>Fisher's Exact Test. \*Statistically significant as it is <0.05.

Abbreviations: SD, standard deviation; CCI, Charlson Comorbidity Index; DS, dependence scale.

**Table 2** Comparison of the Mean of Caregiver Burden, Depression, and Attitude Toward Dementia Before and After Intervention

		Intervention Group (n = 40) Mean $\pm$ SD	Control Group (n = 38) Mean $\pm$ SD	Independent t-Test, t (p-value)
SZBI, total (range 0 ~ 48)	Pre-test	25.53 $\pm$ 9.89	18.0 $\pm$ 6.12	-4.064 (<0.001)
	Post-test	25.13 $\pm$ 9.30	18.42 $\pm$ 7.56	-3.483 (0.001)
	Paired t-test, t (p-value)	0.379 (0.707)	-0.369 (0.714)	
SZBI, personal strain (range 0 ~ 36)	Pre-test	18.85 $\pm$ 8.60	11.03 $\pm$ 5.09	-4.921 (<0.001)
	Post-test	17.25 $\pm$ 8.19	12.47 $\pm$ 6.59	-2.830 (0.006)
	Paired t-test, t (p-value)	1.696 (0.098)	-1.680 (0.101)	
SZBI, role strain (range 0 ~ 12)	Pre-test	7.45 $\pm$ 3.17	6.97 $\pm$ 2.25	-0.762 (0.448)
	Post-test	7.88 $\pm$ 3.43	5.95 $\pm$ 2.65	-2.768 (0.007)
	Paired t-test, t (p-value)	-0.788 (0.435)	1.871 (0.069)	
PHQ-9 (range 1 ~ 27)	Pre-test	6.95 $\pm$ 5.33	5.76 $\pm$ 5.67	-0.953 (0.344)
	Post-test	5.25 $\pm$ 4.84	5.92 $\pm$ 6.66	0.511 (0.611)
	Paired t-test, t (p-value)	2.362 (0.023)	-0.265 (0.792)	
DAS (range 20 ~ 140)	Pre-test	85.10 $\pm$ 16.37	98.34 $\pm$ 18.12	3.390 (0.001)
	Post-test	94.60 $\pm$ 15.52	86.29 $\pm$ 11.64	-2.664 (0.009)
	Paired t-test, t (p-value)	-3.312 (0.002)	4.542 (<0.001)	

Abbreviations: SD, standard deviation; SZBI, short-form Zarit Burden Interview; PHQ-9, Patient Health Questionnaire 9; DAS, Dementia Attitude Scale.

**Table 3** Summary of ANCOVA Results

Outcome Measures	Group	n	Baseline		Post Test		Between-Group Effect	
			Mean (SE)	95% CI	Mean (SE) **	95% CI	F (p-value)	Effect Size <sup>a</sup>
SZBI, total	Control	38	18.0 (0.99)	15.99, 20.01	22.66 (1.35)	19.96, 25.36	0.476 (0.493)	0.007
	Intervention	40	25.53 (1.56)	22.36, 28.69	21.10 (1.30)	18.50, 23.70		
SZBI, personal strain	Control	38	11.03 (0.83)	9.35, 12.70	17.06 (1.18)	14.70, 19.42	4.353 (0.041*)	0.059
	Intervention	40	18.85 (1.36)	16.10, 21.60	12.89 (1.14)	10.62, 15.17		
SZBI, role strain	Control	38	6.97 (0.36)	6.23, 7.71	6.04 (0.65)	4.74, 7.33	2.721 (0.104)	0.037
	Intervention	40	7.45 (0.50)	6.44, 8.46	7.79 (0.63)	6.54, 9.04		
PHQ-9	Control	38	5.76 (0.92)	3.90, 7.63	6.04 (1.21)	3.62, 8.45	0.203 (0.654)	0.003
	Intervention	40	6.95 (0.84)	5.25, 8.65	5.14 (1.17)	2.81, 7.48		
DAS	Control	38	98.34 (2.94)	92.39, 104.30	83.07 (2.77)	77.55, 88.59	10.284 (0.002*)	0.130
	Intervention	40	85.10 (2.59)	79.87, 90.33	97.66 (2.67)	92.33, 102.98		

Notes: <sup>a</sup>Partial eta squared ( $hp^2$ ) value is reported. \*p-value < 0.05; \*\*Adjusted mean score.

Abbreviations: SD, standard error; SZBI, short-form Zarit Burden Interview; PHQ-9, Patient Health Questionnaire 9; DAS, Dementia Attitude Scale.

confirm that the significant difference in the mean SZBI and DAS scores after the intervention was attributed to the CDCI, rather than the effect of the pre-test SZBI (total and personal strain) and DAS scores in the intervention group. The adjusted mean score of the personal strain differed significantly between the groups ( $F = 4.353$ ,  $p = 0.041$ ), that is, the personal strain of the intervention group was reduced. The effect of CDCI on personal strain in the intervention group was found to be 0.059. Additionally, the adjusted mean DAS score differed significantly between the groups ( $F = 10.284$ ,  $p = 0.002$ ). The effect of CDCI on DAS in the intervention group was 0.130, indicating a positive change in attitude in the intervention group. This finding demonstrates the effectiveness of CDCI in reducing personal strain and improving attitudes toward dementia among dementia family caregivers compared to no intervention. However, SZBI total, role strain, and PHQ-9 were not significantly affected by CDCI. These results show that CDCI, as compared with no intervention, may have no benefit in terms of the total burden, role strain, and depression.

## Discussion

To the best of our knowledge, this is the first study to evaluate the effects of the care burden, depression, and attitude toward dementia of informal dementia family caregivers after receiving CDCI as a public intervention provided by six dementia relief centers in two cities in Korea. After eight weeks, the intervention group reported significantly lower personal strain and a significantly higher attitude toward dementia.

The finding that the primary outcome “personal strain” significantly decreased in the intervention group is important. Caregiver burden was evaluated using the SZBI, which encompasses both “personal strain” and “role strain”.<sup>35</sup> Although previous meta-analysis found no effect of dementia caregiver intervention on burden<sup>36–38</sup> or showed a small effect,<sup>16,39</sup> our analysis indicates a small to moderate effect on personal strain. In this study, the effect size of the personal strain subscale for the SZBI was 0.059, which was small to moderate, according to the evidence that a value of 0.02 was classified as a small effect and 0.13 as a moderate effect.<sup>34</sup> A high score of personal strain suggests a need for supportive cognitive-behavioral therapy or counselling or aimed at helping the caregiver manage strong emotional responses (eg, anger, anxiety).<sup>28</sup> In contrast, an increased role strain indicates the need for home support or additional respite care to free up time for the caregiver, to allow them to perform their daily life tasks and other roles.<sup>28</sup> Therefore, because the CDCI in this study focuses on education and service information on dementia management, it was shown to significantly lower the personal strain rather than the role strain. Regarding care burden, caregivers reported strain associated with managing psychological and behavioral symptoms of dementia, the emotional and physical strain of caring with inadequate support from other family members, and the financial strain of reducing work.<sup>19</sup> Increasing the understanding of dementia among family caregivers and reducing the burden of caring by strengthening care skills improves the quality of caring for the elderly with dementia.<sup>35</sup> In particular, at the national level, the infrastructure and awareness for providing appropriate and timely support in the course of disease decreases the high costs of morbidity and dependency.<sup>19</sup> Therefore, it is very

important to build an infrastructure to support people with dementia's caregivers through a trained health workforce at the national level, such as CDCI. Meanwhile, an SZBI score of 17 or higher indicates a severe burden.<sup>40</sup> Both the intervention and control groups had scores of about 19 and 20 after intervention, respectively, showing that the burden of caregivers was still high.

Regarding depression, the secondary healthcare outcome of this study, the score of the intervention group decreased after the intervention, but there was no significant difference compared with the control group. This could be attributed to the fact that when considering the cut-off point for depressive symptoms as 10 points,<sup>41</sup> both groups were in a state of mild depression with five and six points, respectively. However, because the dementia caregiver intervention showed a small effect on depression in the previous meta-analysis study,<sup>16</sup> further research is needed to confirm the effect of CDCI on caregivers with a depression score of 10 or higher in future studies.

Regarding attitude toward dementia, the secondary healthcare outcome of this study replicates the results of a previous study<sup>22</sup> in that it shows effects on attitude. These results show that the higher the awareness level and knowledge of dementia, the more positive the attitude toward dementia.

This study had some limitations. First, although an ANCOVA analysis was performed, there remains a risk of undiscovered covariates (eg, differences in personal characteristics, such as personal perspectives of the two groups) because unmeasured variables could still be present at baseline. Therefore, there is a limitation in that the risk of imbalance between treatment groups still exists, and further research is needed to correct these factors and confirm a more accurate effect. Nevertheless, to minimize the influence of background characteristics on outcomes, we attempted to control for the effects of the six demographic variables (ie, age, CCI, DS score of persons with dementia, living with the patient, number of caregivers, and work status), and two pre-test variables of SZBI (total and personal strain) and DAS when computing the outcomes. The mean post-test SZBI, PHQ-9, and DAS scores were adjusted for. Second, the sample size was small. To increase the significance of the study, large-scale outcome research is required in the future. However, it is significant that participants were recruited from multiple regions and that the intervention CDCI was conducted according to standardized national protocols. Moreover, because the CDCI is being implemented at public health centers (256 dementia relief centers) nationwide according to the law, evaluation research on large-scale public health interventions is possible in the future. Third, we observed a deterioration in attitude toward dementia in the control group after the intervention, which may indicate the need for continuous education on dementia knowledge and cognition. Therefore, it is necessary to observe this pattern in future longitudinal studies.

## Conclusion

We presented the results of a quasi-experimental, non-randomized controlled trial, testing the ongoing Korean National Project, a family support program for community-based dementia caregiver interventions, for dementia family caregivers to reduce caregiver burden, as a primary study outcome. In conclusion, the investigated the family support program was effective in decreasing the personal strain of the caregiver after the intervention, rather than the role strain. The national project also positively improved caregivers' attitudes towards people with dementia as a secondary outcome. In the next step, it is necessary to investigate the respite care program of community-based dementia caregiver interventions to decrease the role strain of the dementia family caregivers. Moreover, refining community-based dementia caregiver interventions by incorporating the unmet needs of family caregivers for the care of persons with dementia might further amplify effectiveness. This study has a quasi-experimental design and, although covariates between treatment groups were confirmed, there is still a possibility that there are differences between treatment groups, which may affect the results.

## Ethics Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.



## Informed Consent

Informed consent was obtained from each participant included in the study.

## Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval for the version to be published; and agreed to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest in this work.

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