Comparison of Factors Related to Health Behavior for Cardiocerebrovascular Disease Prevention in Middle-Aged Women with and without Depression

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Purpose: This study aimed to compare the health beliefs, exercise self-efficacy, and health behavior for cardiocerebrovascular disease prevention in middle-aged women with and without depression. Methods: This study employed a cross-sectional, correlational design using a structured questionnaire. The study participants were 180 middle-aged women aged between 40 and 64 years. The survey was conducted from August to December 2020 in G metropolitan city. The collected data were analyzed using descriptive statistics, the independent t-tests, one-way analysis of variance, analysis of covariance, and Pearson correlation coefficients with the SPSS for Windows version 27.0. Results: Among the study participants, 70 (38.9%) were depressed and 110 (61.1%) were not depressed. A statistically significant difference was found in health behavior for cardiocerebrovascular disease prevention, with a score of 2.21 in the depressed group and 2.40 in the non-depressed group (F=5.46, p=.021). Health behavior for cardiocerebrovascular disease prevention was positively correlated with exercise self-efficacy (r=.51, p<.001) in the depressed group and with health beliefs (r=.49, p<.001) and exercise self-efficacy (r=.42, p<.001) in the non-depressed group. Conclusion: It is necessary to consider the degree of depression in middle-aged women and to prepare strategies to increase exercise self-efficacy while considering health beliefs to promote healthy behavior for cardiocerebrovascular disease prevention.

Key Words: Cardiovascular diseases; Cerebrovascular disorders; Depression; Health behavior; Self efficacy

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INTRODUCTION

The mortality rate because of cardiocerebrovascular disease in Korea was 54,207 cases per year, accounting for 17.8% of all deaths. Although the mortality rate of cardiovascular disease has decreased in the past 10 years, the incidence of cardiocerebrovascular disease is expected to increase further because of an increase in life expectancy and a westernized lifestyle [1]. Meanwhile, cardiocerebrovascular disease differs in mortality and morbidity according to age and gender, and the mortality rate of women is 123 per 100,000 people, which is higher than that of men, ranking first among women’s deaths worldwide [2]. Specifically, the mortality rate increases after the age of 40 years, surpassing the mortality rate of men in their 60s. This is because middle-aged women have an increased incidence of visceral fat obesity, which causes insulin resistance due to decreased estrogen after menopause, and because of decreased vascular endothelial cell function and vascular reactivity, body mass index increases, fasting blood sugar rises, or dyslipidemia occurs more quickly [3]. Therefore, unlike in men, it is necessary to focus more attention on the prevention and management of cardiovascular diseases in middle-aged women.

It is important to practice healthy lifestyle habits, such as smoking, drinking, dieting, and physical activity, to prevent cardiocerebrovascular disease. However, although smoking is an important predictor of cardiocerebrovascular disease, the smoking rate in women is increasing, the practice rate of regular physical activity is decreasing, and the lifestyle that contributes to the occurrence of cardiovascular disease has not improved [1]. However, women are less interested in preventing cardiovascular disease by underestimating their risk of cardiovascular disease [3]. Therefore, it is necessary to identify and prepare strategies to increase health behaviors to prevent cardiocerebrovascular diseases in middle-aged women.

Perceived health belief refers to the belief that an individual perceives a disease and explains health-related behaviors that can maintain and promote health, so behavioral changes and practices for disease prevention can be made according to the individual’s perceived health beliefs [4]. In patients with metabolic syndrome, health beliefs have a positive effect on health behaviors such as exercise and diet management [5]. In patients with high blood pressure and diabetes, health beliefs and health behaviors are also positively related [6]. Exercise self-efficacy refers to a belief in one’s ability to continuously exercise, which not only serves as a strong predictor of physical activity but also motivates exercise and positively rec-ognizes one’s health status [7]. Middle-aged women have a lower degree of physical activity and a lower rate of practicing health behaviors than men [8]. Therefore, before developing interventions to increase physical activity, it is necessary to improve the awareness and motivation of middle-aged women. Accordingly, it will be necessary to confirm the health beliefs and exercise self-efficacy of middle-aged women and to understand the relationship between these variables and cardiovascular disease prevention behavior.

Most women experience menopause between the ages of 45 and 60 years. During this period, women experience physical and social psychological discomfort because of the weakening of ovarian function. These changes in physical and reproductive functions lead to psychological and emotional changes, followed by memory loss, decreased concentration and judgment, and nervousness, resulting in a tendency to lose motivation and depression [9]. Depression has a negative relationship with a healthy lifestyle; therefore, there are differences in subjective health status, stress, physical activity, and drinking depending on the degree of depression in middle-aged women [10]. In other words, since depression in middle-aged women is related to health behavior, their cardiocerebrovascular disease prevention behavior will also differ depending on whether they are depressed.

Therefore, this study aimed to compare health beliefs, exercise self-efficacy, and health behaviors for cardiocerebrovascular disease prevention (HBCDP) depending on where middle-aged women are depressed and to provide basic data to develop nursing interventions to improve the health behaviors for cardiocerebrovascular disease prevention.

METHODS

1. Research Design

This cross-sectional and descriptive study was conducted to compare health beliefs, exercise self-efficacy, and health behaviors for cardiocerebrovascular disease prevention depending on whether they are depressed or not.

2. Participants and Data Collection

The subjects of this study were conveniently sampled middle-aged women aged 40 to 64 years living in Gwangju Metropolitan City. The criteria for selecting research subjects were those who could communicate verbally, understand the purpose of this study, voluntarily agree to
participate in the study, and prepare a written consent form. The exclusion criteria were those who had been diagnosed with cardiocerebrovascular disease and those who had restrictions on daily life activities because of other chronic diseases. To determine the minimum number of participants, correlation analysis was conducted using the G*Power 3.1.9 program. It was calculated on correlation coefficient .35, a significance level of .05, and a power of the test of 80.0% based on the previous study [10]. The minimum required number of participants was 61 for each group. Considering the dropout rate, 192 questionnaires were distributed and collected. After excluding 12 questionnaires with inadequate responses, 180 questionnaires were analyzed.

Data collection for this study was conducted at community centers, banks, insurance companies, and churches in Gwangju Metropolitan City from August to December 2020. Before data collection, we explained the purpose and method of the study to the head of each institution and obtained permission to collect data. Data collection was conducted by the researcher and two research assistants using a face-to-face method. Only participants who signed a consent form could participate in the data collection. The questionnaire response time was approximately 15 minutes. The completed questionnaires were collected in unmarked envelopes. A small gift was given after the survey.

3. Measures

1) Depression

Depression was measured using a tool adapted by Cho and Kim [11] from the Center for Epidemiological Studies-Depression Scale developed by Radloff [12]. This tool comprises 20 questions on a 4-point Likert scale (0~3) and is open access. Responses to each item range from 0 to 3, with zero points indicating "very rare" and three points indicating "most of the time". The score ranges from 0 to 60 points-meaning the higher the score, the higher the depression; 16 to 24 points, probable depression; and ≥25 points, definitive depression. In this study, participants were divided into depressed and non-depressed groups based on 16 points of cut. Cronbach's α was .91 in the original study [11], and .85 in this study.

2) Health belief

Health beliefs were measured using the tool developed by Moon [13] that Bae [14] modified and supplemented with an adult's health belief measurement tool. Before using the tool, permission to use it was obtained by e-mail from the original developer. This tool uses a 5-point Likert scale (1~5) comprising 14 questions. Responses to each item range from 1 to 5, with one point indicating "strongly disagree" and five points indicating "strongly agree". The higher the score, the higher the belief in health. Cronbach's α was .89 in the original study [14], and .73 in this study.

3) Exercise self-efficacy

Exercise self-efficacy was measured using a tool developed by Shin et al. [7]. Before using the tool, permission to use it was obtained by e-mail from the original developer. This tool comprises 18 questions asking how confident you are that you can exercise regularly in a given situation. It is measured with 0 points for "I can't do it at all", 50 points for "I can be sure", and 100 points for "I can do it for sure", and the higher the measured score, the higher the exercise self-efficacy. Cronbach's α was .94 in the original study [7], and .94 in this study.

4) Health behavior for cardiocerebrovascular disease prevention

HBCDP was measured by Ko [15] as a modified and supplemented tool to measure cerebrovascular disease prevention behavior based on the Health Promoting Lifestyle Profile II developed by Walker and Hill-Polerecky [16]. This tool confirms the validity of experts in preventing cerebrovascular disease. In this study, it was measured by modifying it to "cardiocerebrovascular disease" instead of the term "cerebrovascular disease". This tool is a 4-point Likert scale (1~4) comprising 52 questions: eight items on physical activity; nine items on health responsibility; nine items on spiritual growth; nine items on nutrition; nine items on interpersonal relationships; and eight items on stress. Responses to each item range from 1 to 4, with one point indicating "strongly disagree" and four points indicating "strongly agree". The measured score is calculated as the average score and the range of the score is from 1 to 4. The higher the measured score, the higher the HBCDP score. Cronbach's α was .94 in the original study [15], and .95 in this study.

4. Ethical Consideration

The study was approved by the institutional review board of the authors' institution (IRB no. 1040173-202002-HR-003-02). Participants were informed of the study objectives, questionnaire contents, data confidentiality and anonymity, and their right to refuse to participate at any time. Written informed consent was obtained from all the participants before the study commenced. It was explained that if the participant had any doubts while participat-
ing in this study, they could inquire at any time from the researcher, research assistant, or the person in charge of the IRB committee and provide contact information. It was explained that the collected data would be stored for 3 years after the completion of the study, in accordance with the IRB Committee guidelines, and then securely shredded and discarded.

5. Data Analysis

The collected data were analyzed using IBM SPSS Statistics for Windows, version 28.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was judged based on \( p < .05 \) on both sides. The differences in general characteristics and health behavior-related factors between the depressed and non-depressed groups were analyzed using descriptive statistics, chi-square, independent t-test, and analysis of covariance. The differences in the degree of HBCDP according to general characteristics were analyzed using an independent t-test, one-way analysis of variance, and Scheffe as a post-hoc test. Correlations between variables were analyzed using Pearson's correlation coefficients.

RESULTS

1. Differences in General Characteristics according to the Subject’s Depression Status

The depression score of the study subjects was 15.42 ± 8.76 points, and the score range was 5–51 points. Because of the analysis divided by cut-off points, 70 subjects (38.9 %) were depressed with 16 points or more, and 110 subjects (61.1%) were not depressed with 16 points or less. The average age of the depressed group was 52.41 years old, with 31 people in their 50s (44.3%), and the average age of the non-depressed group was 61.39 years old, with 54 people in their 40s (49.1%); however, the difference was not statistically significant (\( \chi^2=4.57, p=.102 \)). The number of people with spouses was 54 (77.1%) in the depressed group, which was significantly lower than 97 (88.2%) in the non-depressed group (\( \chi^2=7.87, p=.005 \)). The level of education was 43 (61.4%) in the depressed group under high school graduation, significantly higher than 44 (40%) in the non-depressed group (\( \chi^2=7.87, p=.006 \)). In the case of having a job, 25 people (35.7%) in the depressed group had a higher than 22 people (20%) in the non-depressed group (\( \chi^2=5.48, p=.024 \)), and when the family monthly income was more than 3 million won, the depressed group was 24 (34.3%), which was lower than the non-depressed group of 62 (56.4%), showing a statistically significant difference (\( \chi^2=8.75, p=.013 \)). The menopausal status (\( \chi^2=2.82, p=.244 \)), religion (\( \chi^2=1.07, p=.300 \)), current disease (\( \chi^2=2.94, p=.229 \)), smoking (\( p=.378 \)), alcohol use (\( \chi^2=.201, p=.367 \)), and body mass index (BMI) (\( \chi^2=2.48, p=.290 \)) were not statistically significant in middle-aged women with and without depression (Table 1).

2. Differences in Health Beliefs, Exercise Self-efficacy, and Health Behaviors to Prevent Cardiovascular Disease according to the Subject’s Depression Status

The spouses, education level, jobs, and family monthly income were not homogeneous between the depressed and non-depressed groups among the general participant characteristics; therefore, the difference in HBCDP was analyzed with ANCOVA under the control of these variables. The study revealed that there was no significant difference in health belief (Range 14~70) with 49.66±5.88 points in the depressed group and 50.53±6.28 points in the non-depressive group (F=0.01, \( p=.992 \)), and there was no significant difference in exercise self-efficacy (Range 0~100) with 44.09±20.16 points in the depressed group and 44.36±19.11 points in the non-depressed group (F=0.41, \( p=.522 \)). However, there was a statistically significant difference in HBCDP (Range 1 to 4) as the depressed group scored 2.21±0.46 points, lower than the non-depressed group’s 2.40±0.40 points (F=5.46, \( p=.021 \)) (Table 2).

3. Differences in Health Behavior for Cardiovascular Disease Prevention according to General Characteristics in Depressed and Non-depressed Groups

Table 3 shows the results of examining the differences in HBCDP according to general characteristics. In the depressed group, there were statistically significant differences in age and BMI. Those in their 50’s ages were higher HBCDP than 40’s ages (F=4.42, \( p=.016 \)), and those with BMI between 23 to 25 were higher HBCDP than with a BMI above 25 (F=4.65, \( p=.013 \)). Contrastingly, in the case of the non-depressed group, participants with college graduates or higher were significantly higher than those with high school graduates or lower (t=-2.03, \( p=.045 \)).

4. Correlation between Variables by Depression Status

In the depressed group, HBCDP and exercise self-efficacy
showed a significant positive correlation (r = .51, p < .001). Contrarily, the non-depressed group, HBCDP, health beliefs (r = .49, p < .001), and exercise self-efficacy (r = .42, p < .001) had a significant positive correlation (Table 4).

**DISCUSSION**

This study was conducted to provide basic data for intervention development to promote health behavior by...
identifying the difference between health beliefs and exercise self-efficacy according to depression, and to compare the factors affecting HBCDP in middle-aged women.

In this study, the HBCDP score was significantly lower in the depressed group 2.21 out of 4 points, which was 55.3 points when converted to 100 points, and 2.40 out of 4 points, which was 60.0 points when converted to 100 points in the depressive and non-depressed groups, respectively. This was lower in both groups than 2.73 out of 4 points, which was 68.3 points of Lee and Hwang [17] for mid-

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### Table 3. Difference in Health Behavior for Cardiocerebrovascular Disease Prevention according to the General Characteristics in Middle-Aged Women with and without Depression (N=180)

| Characteristics | Categories | Depressed group (n=70) | Non-depressed group (n=110) |
|-----------------|------------|------------------------|----------------------------|
|                 | M±SD       | t or F (p)             | M±SD                       | t or F (p) |
| Age (year)      |            |                        |                            |
| 40~49           | 2.03±0.30  | 4.42                   | 2.34±0.36                  | 1.31       |
| 50~59           | 2.38±0.54  | (.016)                 | 2.47±0.44                  | (.274)     |
| ≥60             | 2.16±0.38  | a < b†                 | 2.43±0.38                  |            |
| Spouse          | Yes        | 2.26±0.47              | -1.53                      | 2.42±0.39  | -1.29 |
|                 | No         | 2.06±0.40              | (.130)                     | 2.27±0.41  | (.200) |
| Education level | ≤ High school | 2.21±0.50              | 0.03                       | 2.31±0.35  | -2.03 |
|                 | ≥ College  | 2.21±0.38              | (.981)                     | 2.46±0.42  | (.045) |
| Menopausal status | Premenopause | 2.15±0.39              | 0.44                       | 2.35±0.39  | 0.62  |
|                 | Perimenopause | 2.30±0.35              | (.646)                     | 2.44±0.40  | (.543) |
|                 | Postmenopause | 2.21±0.54              |                           | 2.44±0.40  |            |
| Religion        | Yes        | 2.21±0.44              | 0.06                       | 2.37±0.40  | 0.83   |
|                 | No         | 2.22±0.48              | (.949)                     | 2.44±0.39  | (.411) |
| Job             | Employed   | 2.27±0.55              | 0.75                       | 2.42±0.39  | 0.18   |
|                 | Unemployed | 2.18±0.40              | (.454)                     | 2.37±0.40  | (.856) |
| Family monthly income (10,000 won) | < 200 | 2.16±0.41              | 0.53                       | 2.44±0.50  | 0.13   |
|                 | 200~ < 300 | 2.18±0.45              | (.594)                     | 2.40±0.34  | (.880) |
|                 | ≥ 300      | 2.29±0.51              |                           | 2.39±0.39  |            |
| Current disease | Yes        | 2.21±0.46              | -0.04                      | 2.36±0.31  | 1.04   |
|                 | No         | 2.20±0.46              | (.965)                     | 2.43±0.45  | (.302) |
| Smoking         | Never      | 2.21±0.46              | 0.20                       | 2.41±0.40  | 1.23   |
|                 | Current or former | 2.16±0.29              | (.842)                     | 2.05±0.15  | (.204) |
| Alcohol use     | None       | 2.21±0.51              | 0.03                       | 2.40±0.40  | 0.10   |
|                 | Sometimes  | 2.22±0.42              | (.973)                     | 2.39±0.42  | (.904) |
|                 | Frequent   | 2.27±0.17              |                           | 2.45±0.27  |            |
| Body mass index (kg/m²) | < 23 (normal) | 2.21±0.35              | 4.65                       | 2.45±0.41  | 1.66   |
|                 | 23~25 (overweight) | 2.44±0.64              | (.013)                     | 2.35±0.40  | (.196) |
|                 | ≥ 25 (obesity) | 1.98±0.35              | b > c†                     | 2.27±0.31  |            |

M=mean; SD=standard deviation; † Scheffe post hoc test.

### Table 4. Correlations between Health Beliefs, Exercise Self-efficacy, and HBCDP in Middle-Aged Women with and without Depression (N=180)

| Group          | Variables          | Health belief          | Exercise self-efficacy |
|----------------|--------------------|------------------------|------------------------|
|                | r (p)              | r (p)                  |
| Depressed group| Health belief      | 1                      | 1                      |
|                | Exercise self-efficacy | .23 (.054)          | .51 (< .001)          |
|                | HBCDP              | -.03 (.828)           |                        |
| Non-depressed group| Health belief      | 1                      | 1                      |
|                | Exercise self-efficacy | .41 (< .001)          | .42 (< .001)          |
|                | HBCDP              | .49 (< .001)          |                        |

HBCDP=Health behavior for cardiocerebrovascular disease prevention.
dle-aged women and 3.2 out of 5 points, which was 65.4 points for middle-aged women with cardio-cerebrovascular disease risk factors using similar tools. This difference is interpreted in previous studies [17]; since the subject was a person with a central obesity risk factor or a cardio-cerebrovascular disease risk factor, the risk perception for the disease was higher than that of the subject of this study, so HBCDP was higher. However, a study by Ko [15], which measured stroke prevention behavior of middle-aged adults with the same tool, showed 2.22 out of 4 points, which was 55.5 points, and 2.12~2.23 out of 4 points, which was 52.5~55.8 points of Kim and Hwang [18] for middle-aged male office workers, were like the depressed group in this study, but higher in the non-depressed group.

In this study, the depressed group had a lower health behavior practice rate than the non-depressed group, which is consistent with the report by Delaney et al. [19] that depressed people are more likely to not follow the recommended medical instructions and that self-nursing performance is more than twice that of those who do not. Cardiovascular disease is known to prevent approximately 80.0% of early deaths by improving lifestyle and controlling risk factors [20]. Therefore, it is important to continue to practice health activities to prevent cardiovascular diseases in daily life. However, several studies have reported that there is a significant inverse correlation between health behavior practices and depression and that depression is an important factor influencing middle-aged women's health behavior [19,21-23]. Accordingly, to induce effective health behavior practice to prevent cardio-cerebrovascular disease in middle-aged women, a customized intervention program considering the degree of depression of the subject should be developed and applied.

In this study, HBCDP was higher in the 50s group than in the 40s group in the depressed group. This is in line with the results of Lee and Hwang [4] that people under 50 years of age have a low health behavior practice rate because they are less exposed to cardio-cerebrovascular disease risk factors. Lee [22] showed that health practice behavior increases with age in middle-aged men and women. Additionally, considering that Korea mainly applies cardio-cerebrovascular disease prevention programs to the elderly [24,25], it is necessary to motivate them to induce continuous interest and management from a young age to effectively prevent and manage chronic diseases.

As a result of this study, there were significant differences in HBCDP according to age and BMI and HBCDP in the depressed group. Then again, in the non-depressed group, there were significant differences in HBCDP according to the level of education and HBCDP. In a study by Lee and Choi [26], knowledge of cardio-cerebrovascular disease was reported as a factor affecting preventive behavior of cardio-cerebrovascular disease, and in the study by Lee and Hwang [17] in middle-aged women, knowledge related to cardio-cerebrovascular disease prevention and physical activity practice rate were affected. Additionally, in a study by Kong et al.[27], which studied men in their 30s and 40s, cardio-cerebrovascular disease awareness and marital status were influencing factors, and a study by Ko [15], revealed that knowledge and BMI were common factors influencing cerebrovascular prevention behavior in middle-aged adults. Although it was not possible to confirm the knowledge level or educational experience of cardio-cerebrovascular disease in this study, the educational level of the participants in the non-depressed group was higher than that in the depressed group. This result seems to be because the higher the level of education, the greater the experience of the various types of education. Therefore, it is necessary to compare the subjects' educational level as well as their knowledge and educational experience in cardio-cerebrovascular disease when planning future research.

HBCDP and exercise self-efficacy showed a positive correlation in the depressed group. Then again, in the non-depressed group, HBCDP, health beliefs and exercise self-efficacy showed a positive correlation. Exercise self-efficacy was found to relate to HBCDP regardless of depression. Perception of disease leads to health behavior practices by increasing the ability to perceive risks and recognize the benefits of health problems among health beliefs [28]. This study revealed a difference in middle-aged women with and without depression, and health belief was the factor that related to HBCDP in the non-depressed group. In a previous study, health beliefs are known to have a positive effect on health promotion behavior [6]. Health beliefs are explained by the severity, sensitivity, and benefits of the disease [13]. A subgroup analysis of health beliefs could not be performed in this study. However, participants in the depressed group may be lethargic for life, which is thought to have low severity and sensitivity to disease. Health beliefs may not be a significant factor related to HBCDP. Depression among middle-aged women increases with age. The prevalence of depression among middle-aged women in their 40s, 50s, and 60s was 4.6%[29]. Therefore, it is necessary to identify the degree of depression and consider their health beliefs to identify and improve HBCDP in middle-aged women. In a future study, it will be necessary to check the mediating
and moderating effects of health beliefs on the relationship between depression and HBCDP in middle-aged women and to plan a differentiated intervention depending on whether the subject is depressed. Moreover, in nursing practice, when checking the HBCDP in middle-aged women, it is necessary to prepare practical guidelines for assessing depression and apply individualized interventions according to priorities based on these results. Exercise self-efficacy was found to be a factor related to HBCDP regardless of depression. Health beliefs were an important prerequisite for preventive health behavior, treatment behavior, and behavior change for specific diseases, and self-efficacy was especially important in determining the relationship between health beliefs and health behavior [30,31].

In this study, the degree of physical activity of the study participants was not objectively confirmed. However, studies showing that exercise self-efficacy [7] was an relating factor of HBCDP indicate that interventions that increase motivation factors, such as exercise self-efficacy, should be considered when planning an exercise intervention program. This study is therefore meaningful in this respect. Regular exercise is an important health activity to prevent most diseases, including chronic diseases. The higher the exercise practice rate, the better the health behavior for disease prevention, and regular physical activity reduces the risk of cardiocerebrovascular disease [17]. Furthermore, it is important to motivate people to exercise so that it can be continued consistently because it can be of practical help to health [17]. The results of this study showed that the higher the exercise self-efficacy in both the depressed and non-depressed groups, the better the HBCDP score. Exercise self-efficacy is the belief that an individual can successfully perform physical activity and acts as an especially important factor in continuous exercise practice [31]. Several studies have reported that the higher the exercise self-efficacy, the higher the exercise practice rate [28] which supports the results of this study. Exercise is an effective way to improve psychological and physical health in middle-aged women, but Kim and Hwang [18] showed that the regular exercise rate of over three times a week was only 26.1%, and the physical activity practice rate has been continuously decreasing since 2014, of which women aged 30–59 decreased the most. Therefore, to increase HBCDP in middle-aged women, an intervention strategy is required to improve motivation and self-efficacy for exercise practice by developing various exercise programs that consider the physical and psychological characteristics of middle-aged women.

This study is meaningful in that it compared and identified the relating factors of HBCDP according to depressed and non-depressed groups for middle-aged women, but has a limitation that is not analyzed the causal relationship among various variables and is collected data in one region. Nevertheless, depression has a negative effect on health management by showing a tendency to avoid or delay situations rather than solve problems, and exercise self-efficacy has been identified as an important variable that increases HBCDP in both depressed and non-depressed groups. Therefore, to practice healthy behaviors to prevent cardiocerebrovascular disease in middle-aged women, health promotion strategies that can improve health beliefs and exercise self-efficacy should be prepared considering the depression.

CONCLUSION

The results of this study showed that health behaviors to prevent cardiocerebrovascular disease in middle-aged women living in the community were positively correlated with exercise self-efficacy in the depressed group. Additionally, in the non-depressed group, HBCDP were positively correlated with health beliefs and exercise self-efficacy. Thus, it was confirmed that exercise self-efficacy is a particularly important factor in preventing cardiocerebrovascular disease regardless of depression in middle-aged women, and active efforts are needed at community health institutions to lead to steady exercise practice.

Therefore, based on the results of this study, it is expected that applying an intervention program that includes strategies to increase exercise self-efficacy in middle-aged women can greatly contribute to maintaining and improving health after middle age by promoting HBCDP. However, since this study did not significantly confirm the difference in factors affecting HBCDP according to the depressed group and non-depressed group of middle-aged women, to practice healthy behavior to prevent cardiocerebrovascular disease in middle-aged women, customized programs that can improve health beliefs or exercise self-efficacy should be prepared in consideration of the degree of depression.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

AUTHORSHIP

Study conception and design acquisition ~ Ko, E, and Kim, H; Data collection ~ Ko, E; Analysis & Interpretation of data ~ Ko, E and Kim, H; Drafting & Revision of the manuscript ~ Ko, E and Kim, H.
REFERENCES

1. Statistics Korea. 2021 Annual report on the causes of death statistics [Internet]. Daejeon: Statistics Korea; 2022 [cited 2022 September 5]. Available from: https://kosis.kr/statHtml/statHtml.do?orgId=101&tblId=DT_1B34E07&vw_cd=MT_TITLE&list=F_27&scrId=&seqNo=&lang_mode=ko&objc_var_id=&itm_id=&conn_path=K1&path

2. Appelman Y, van Rijn BB, ten Haaf ME, Boersma E, Peters SA. Sex differences in cardiovascular risk factors and disease prevention. Atherosclerosis. 2015;241(1):211-218. https://doi.org/10.1016/j.atherosclerosis.2015.01.027

3. Choi JY, Jeon MY, Seo YM, Choi SY. Risk assessment for cardiocerebrovascular disease in middle-aged women workers. Journal of Korea Convergence Society. 2017;8(8):137-145. https://doi.org/10.15207/JKCS.2017.8.8.137

4. Lee SK, Hwang SY. Effects of oral health awareness and oral health behavior on preventive behavior of cardiocerebrovascular disease in cardiocerebrovascular disease risk group. Journal of the Korea Academy-Industrial cooperation Society. 2018;19(8):303-311. https://doi.org/10.5762/KAIS.2018.19.8.303

5. Sally WSL, Chair SY, Lee FK. Factors associated with health-promoting behavior of people with or at high risk of metabolic syndrome: based on the health belief model. Applied Nursing Research. 2015;28(2):197-201. https://doi.org/10.1016/j.apnr.2014.11.001

6. Beverey L, Kristine VA, Celeste L, Wayne P, Nandini N, Frederick B. Self-reported health beliefs, lifestyle and health behaviours in community-based patients with diabetes and hypertension. Canadian Journal of Diabetes. 2011;35(5):490-496. https://doi.org/10.1016/S1499-2671(11)00004-3

7. Shin YH, Jang HJ, Pender NJ. Psychometric evaluation of the exercise self-efficacy scale among Korean adults with chronic diseases. Research in Nursing & Health. 2001;24(1):68-76. https://doi.org/10.1002/1098-240X(200102)24:1<68::AID-NUR1008>3.0.CO;2-C

8. Park CJ. Menopause symptoms, stress, health promotion behavior and quality of life in middle-aged women. Journal of the Korean Data analysis Society. 2022;24(4):1471-1482. https://doi.org/10.37727/jkdas.2022.24.4.1471

9. Kwon E, Kim H, Joe SH, Ko SD, Cho HI. Association of menopausal status, psychological factors, health behaviors and depressive symptoms of middle-aged Korean women. Health and Social Science. 2014;0(35):25-54.

10. Lee EH, So AY, Lee KS. Comparison of health locus of control, depression, wellbeing, and health promoting lifestyle profile II in middle aged Korean and Korean-American women. Korean Journal of Women Health Nursing. 2010;16(2):157-165. https://doi.org/10.4069/kjwhn.2010.16.2.157

11. Cho MJ, Kim KH. Diagnostic validity of the CES-D (Korea version) in the assessment of DSM-III-R major depression. Journal of Korean Neuropsychiatric Association. 1993;32(3):381-399.

12. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Applied Psychological Measurement. 1977;1(3):385-401. https://doi.org/10.1177%2F014662167700100306

13. Moon JS. A study of instrument development for health belief of Korean adults [dissertation]. Seoul: Yonsei University; 1990.

14. Bae MS. Related factors with health behaviors of foreign students studying in Korea [dissertation]. Daegu: Yeungnam University; 2009.

15. Ko E. Factors influencing stroke prevention behaviour in middle-aged adults. Journal of Korean Biological Nursing Science. 2020;22(4):297-307. https://doi.org/10.7586/jkbns.2020.22.4.297

16. Walker SN, Hill-Polerecky DM. Psychometric evaluation of the health-promoting lifestyle profile II. Unpublished Manuscript. University of Nebraska Medical Center. 1996:13:120-126.

17. Lee BJ, Hwang SY. Effects of physical activity practice rates and knowledge related to cardiocerebrovascular disease prevention on health behavior case study focusing on middle aged women with risk of central obesity. Journal of the Korea Academia-Industrial cooperation Society. 2018;19(4):342-352. https://doi.org/10.5762/KAIS.2018.19.4.342

18. Kim EJ, Hwang SY. Awareness and utilization of mobile health and preventive health behavior according to cardiovascular risk factor cluster type in early middle-aged male workers. Korean Journal of Adult Nursing. 2019;31(5):562-572. https://doi.org/10.7475/kjan.2019.31.5.562

19. Delaney C, Apostolidis B, Bartos S, Morrison H, Smith L, Forstiny R. A randomized trial of telemonitoring and self-care education in heart failure patients following home care discharge. Home Health Care Management & Practice. 2013;25(5):187-195. https://doi.org/10.1177%2F014662167700100306

20. World Health Organization. Preventing chronic diseases: a vital investment. WHO Global Report. Geneva, CH: Author; 2005.

21. See SY. Life satisfaction, activities of daily living, depression and health behavior of low-income elderly living at home. The Journal of Muscle and Joint Health. 2010;17(2):162-172. https://doi.org/10.5953/JMJH.2010.17.2.162

22. Lee BH. A mediating effects of periodontal status on relationship between health practice behaviors and depression of middle-aged adults. Journal of the Korea Convergence Society. 2019;10(8):45-52. https://doi.org/10.15207/JKCS.2019.10.8.045

23. Yang J. A study on the participation motives, successful aging, health behavior and depression in women after menopause.
24. Chang KO, Lim JH, Lee SY. The effect of a health keeper's cardiocerebrovascular disease prevention activity on elders' physical fitness, BMI and physiologic parameters. Journal of the Korean Data Analysis Society. 2018;20(1):487-499. https://doi.org/10.37727/jkdas.2018.20.1.487

25. Kim JY, Ryu HS. The effects of an cardiocerebrovascular disease prevention program on cardiovascular risk factors and quality of life in elderly. Journal of the Korean Applied Science and Technology. 2019;36(1):237-247. https://doi.org/10.12925/jkots.2019.361.237

26. Lee YO, Choi YH. Factors affecting the preventive behavior of cardiocerebrovascular disease in blue color workers. The Korean Journal of Rehabilitation Nursing. 2013;16(1):63-70. https://doi.org/10.7587/kjrehn.2013.63

27. Kong JH, Choi HO, Oh EJ. The relationship among cardiocerebrovascular disease knowledge, attitude of, health behavior among 30, 40s male workers. Journal of the Korea Contents Association, 2016;16(7):309-318. https://doi.org/10.5392/JKCA.2016.16.07.309

28. Min ES, Hur MH. Predictors of compliance in hypertensive patients. Journal of Korean Academy of Fundamentals of Nursing. 2012;19(4):474-482. https://doi.org/10.7739/jkafn.2012.19.4.474

29. Statistics Korea. Socio-demographic distribution of annual prevalence of major depressive disorders [Internet]. Daejeon: Statics Korea; 2022 [cited 2022 October 13]. Available from: https://kosis.kr/statHtml/statHtml.do?orgId=117&tbid=TX_117_2009_HB101&conn_path=12

30. Shin KR, Kang YM. A Study on the relationships between osteoporosis knowledge, self-efficacy and health belief of women in an island. Journal of Korean Academy of Nursing. 2002; 32(1):89-99. https://doi.org/10.4040/jkan.2002.32.1.89

31. Piaseu N, Schepp K, Belza B. Causal analysis of exercise and calcium intake behaviors for osteoporosis prevention among young women in Thailand. Health Care Women International. 2002;23(4):364-376. https://doi.org/10.1080/0739933029008937