

Research Article

Factors Influencing Cardiovascular Disease Preventive Behaviors among Rural Residents Based on a Socio-Ecological Model in South Korea: A Mixed Method Research

Bohyun Park ¹, Juhyeon Yang ¹, and Youngsoo Kim ²

¹Department of Nursing, Changwon National University, Changwon, Gyeongnam, Republic of Korea

²Department of Public Healthcare, Gyeongsang National University Changwon Hospital, Changwon, Gyeongnam, Republic of Korea

Correspondence should be addressed to Bohyun Park; bhpark@changwon.ac.kr

Received 29 September 2022; Revised 9 March 2023; Accepted 10 November 2023; Published 25 November 2023

Academic Editor: Gianpiero Greco

Copyright © 2023 Bohyun Park et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Objective. This study aimed to explore the influencing factors to the practice of cardiovascular disease (CVD) preventive behaviors among rural residents based on socio-ecological model (SEM). **Methods.** We used a mixed-methods research using the sequential explanatory design. From a total of 109 participants, quantitative data including CVD preventive behavior, self-efficacy, social support, and sense of community were collected using previously developed measurement tools. For quantitative research, descriptive statistics and Pearson correlation analysis were conducted. For qualitative research, descriptive statistics and Pearson correlation analysis were conducted. Questions for qualitative research were constructed based on SEM for the three subareas identified in quantitative research. Qualitative content analysis was conducted on qualitative data collected through focus group interviews from 14 participants. **Results.** According to quantitative research results, participants had a low level of practice in physical exercise, stress management, and self-checking among seven subdomains. At the individual level, self-efficacy was positively correlated with sleep management, and at the interpersonal level, family support was positively correlated with smoking cessation and support from significant others was positively correlated with stress management. On the other hand, at the community level, sense of community did not show significant correlation with the practice of cardiovascular disease prevention. Next, according to qualitative research results, 8 themes were identified in three levels as obstacles. At the personal level, overwork, loneliness, and lack of knowledge about CVD; at the interpersonal and community level, decreased activities with residents due to increased individualistic tendencies and decreased sense of community; and at the community environmental level, inconvenience of sidewalks, lack of community space, and insufficient functioning of village health clinics. **Conclusion.** In order to reduce obstacles to health behavior practice to prevent cardiovascular disease, multidimensional efforts are needed in terms of socio-ecological aspects.

1. Introduction

Cardiovascular disease (CVD) is severe life-threatening disease and is the leading cause of death globally [1] and the second largest cause of death in Korea [2]. Studies have shown that death caused by CVD or risk of developing CVD can be lowered by lifestyle changes and preventive management [3, 4]. Lifestyle habits influencing CVD include smoking, drinking, lack of exercise, unhealthy diets, and stress management [5]. These lifestyle factors can significantly improve through individuals' efforts, but the improved habits are not easy to maintain and

manage [6]. The American Heart Association emphasizes the need for attention to multidimensional factors such as social determinants (socioeconomic factors) and the community environment surrounding the individual that influence cardiovascular health [7]. A socio-ecological approach provides a helpful framework to understand health by considering these factors. The SEM proposed by McLeroy et al. divides the factors influencing health into intrapersonal, interpersonal, organizational, community, and public policy [8]. This suggests that health behaviors involve social support, organizational approach, political responsibility, and personal responsibility.

Compared with urban residents in terms of health and behaviors, rural residents may have increased metabolic syndrome, such as obesity, hypertension, and diabetes [9], and may be practicing fewer healthy lifestyle habits, including smoking cessation, moderate alcohol consumption, and exercise [10]. Moreover, since rural communities are distant from medical institutions such as hospitals without easy access to public transportation, rural residents may not receive timely treatment [11]. Rural residents showed a lower level of overall satisfaction with health and life than their urban counterparts [12]. Furthermore, in rural community, as the number of older adults living alone and with a lowered support system is increasing, there is an increase in depression and stress among rural residents compared with urban residents [13].

Considering this backdrop, it is necessary to explore the multifaceted factors influencing preventive behavioral practices of CVD using the socioecological model and should formulate effective strategies. Most research on CVD analyzed risk factors related to its incidence [14, 15]. Although a few studies examined CVD preventive behaviors, these were limited to a few cognitive factors, such as individuals' knowledge [16] and psychological features, such as self-efficacy [17], failing to provide a comprehensive perspective on the multidimensional factors.

1.1. Research Purpose. This study aimed to explore the influencing factors and obstacles to the practice of CVD preventive behaviors among rural residents, on the base of SEM.

2. Methods

2.1. Study Design. This mixed-method research of sequential explanatory design was used (Figure 1). Quantitative research can help identify specific influencing positive or negative behavioral factors when analyzing health behaviors. However, since quantitative analysis alone cannot explore the context in which they came to affect, it is difficult to properly interpret the research results and establish effective intervention strategies. To address this limitation, many studies are utilizing mixed-methods research [18]. In mixed method research, various research designs can be created depending on how two components are mixed. When a study aim is in-depth interpretation of quantitative research results, as in this study, sequential explanatory design can be applied [18]. The results from this approach will contribute to the comprehensive understanding of the health behaviors of rural residents and establishment of multidimensional strategies.

2.2. Participants. The target region was K-gun at South Korea and is a rural community. The participants were recruited with the village leader; a total of 109 villagers participated in the study. The inclusion criteria were (1) residents aged 45 or older and (2) who agreed to participate in the study voluntarily. In middle age, the likelihood of developing chronic disease increases due to decreased disease resistance and increased external stress [19]. Therefore, in order to include both the middle-aged and the elderly, the age criteria for the study were determined for those aged 45 or older. When correlation analysis was performed using the

G-power program with a significance level (α) of 0.05, an effect size median of 0.3, and a power ($1-\beta$) of 0.90, the number of required participants was calculated as 109.

Focus groups were organized to explore obstacles to the practice of CVD preventive behaviors for personal, interpersonal, and community aspects; these groups were formed from those who participated in quantitative research and consented to participate in in-depth interviews. In total, two focus groups included seven female and seven male participants.

2.3. Data Collection. The quantitative surveys were conducted by the author and two research assistants (doctoral students and nursing students). We held a premeeting and educated the research assistants on the survey method to obtain the measurement reliability. We collected data in June 2021. A qualitative survey was conducted in July 2021 as focus group interviews.

2.4. Measures

2.4.1. Quantitative Research

(1) Personal Aspect: Self-Efficacy. It was measured using New General Self-Efficacy tool, developed by Chen et al. [20]. It consists of eight items on a five-point scale (1: almost never, 5: always). The Cronbach's α for reliability during its development was 0.86 [20] and that in this study was 0.91.

(2) Interpersonal Aspect: Social Support. It was measured by the Multidimensional Scale of Perceived Social Support developed by Zimet et al. [21]. This tool consists of 12 items, in subdomains of family support (4 items), friend support (4 items), and support from significant others (4 items), on a five-point scale (1: strongly disagree, 5: strongly agree). Significant others in this tool indicate neighbors, coworkers, boyfriends and girlfriends, or religious people, except for medical staff, family members, and friends. Cronbach's α for reliability during development was 0.88, that in Shin and Lee was 0.83 [21], and that in this study was 0.89.

(3) Community Aspect: Sense of Community. It was measured by the tool developed by organizing questions based on the theory of McMillan and Chavis [22] modified for the Korean situation through factor analysis. This tool consists of 15 items on a five-point scale (1: not at all, 5: very much) in subdomains of fulfillment, solidarity, sense of belonging, influence, and shared emotional connection. Cronbach's α for each domain was 0.81 for fulfillment, 0.77 for solidarity, 0.77 for sense of belonging and influence, and 0.74 for shared emotional connection in McMillan and Chavis [22]. In this study, Cronbach's α was 0.92 for all items.

(4) CVD Preventive Behaviors. This was measured using the tool developed by Park [23], based on the "lifestyle evaluation tool" for 40-year-olds produced by the Health Insurance Service. The tool consists of 18 items on a five-point scale in the seven domains of smoking, drinking, physical activity, diet, stress, sleep, and self-rating. Regarding smoking, some questions did not apply to nonsmokers, and for dietary habits,

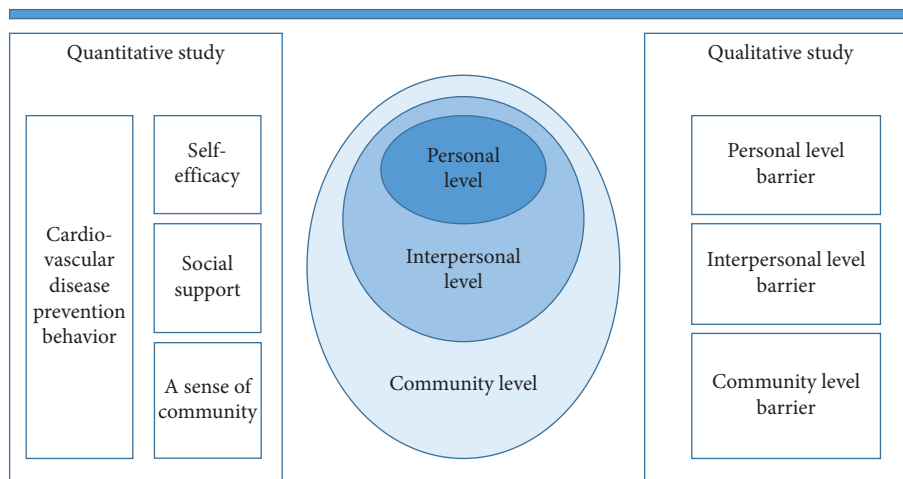


FIGURE 1: Design and process of this study.

the criteria for each scale were different from other questions. They were revised and supplemented by the researcher before the content validity was checked by six experts: one internal medicine specialist, two preventive medicine specialists, and three nursing professors. After calculating the content validity index for each item, the final 15 items were selected by excluding 3 items with a score of less than 0.7. The higher the score of each item, the higher the degree of CVD preventive behavior practice. Cronbach’s α for this tool was 0.73 in Park [23] and 0.63 in this study.

(5) *Demographic Characteristics.* The demographic characteristics and underlying diseases comprised age, gender, education level, number of family members living together, type of family living together, income level, medical insurance type, period of residence in the current residence, and underlying diseases.

2.4.2. *Qualitative Research.* The focus group interview questions were centered around the three least frequent behaviors (exercise, stress, and self-checking) based on the quantitative research analysis results. These are questions considering socio-ecological aspects, “What efforts are you taking for your health in your daily life?”, “What factors make it difficult for you personally to exercise, manage stress, and self-check?”, “Are your relationships with residents helpful in exercising, managing stress, and self-checking? (If not, why is that?)”, “What factors in terms of village environment make it difficult for you to exercise, manage stress, and self-check?, and What are some of the villages’ environmental problems that need to be improved (e.g., pedestrian roads, lack of welfare facilities, and medical resources)?”.

2.5. Analysis

2.5.1. *Quantitative Research.* Data from the questionnaires collected were analyzed using SPSS 27.0. Descriptive statistics of demographic characteristics and significant variables were identified. Pearson’s correlation analysis was

performed to confirm the correlation between individual, interpersonal, and community factors and the degree of CVD preventive behavior practice.

2.5.2. *Qualitative Research.* This study analyzed the data following the three-step process of preparation, organization, and result reporting, which is inductive qualitative content analysis, as suggested by Elo and Kyngäs [24]. The organizing step included open coding, categorization, and generalization.

In the preparation stage, the research team decided on this study’s content while performing related research tasks. The researchers decided to adopt a sequential explanatory design method and set the topic for qualitative research based on the concerns from the quantitative research results that require further in-depth analysis. The SEM, applied in quantitative research, also served as the theoretical framework for qualitative research. The SEM, suggested by McLeroy et al. [8], presents five levels: individual, interpersonal, organizational, community, and public policy. However, it is applied at three levels (individual, interpersonal, and community) considering the applicability to the target village and residents and the balance with quantitative research.

For the organization process, the researcher became familiar with the data after reading it repeatedly and created the initial codes by naming words, phrases, or sentences that have important meanings or characteristics related to the research question. After creating a topic by grouping related codes together while comparing the contents and characteristics of the generated code, the topic was named to generalize the codes included in each topic. Next, according to the content and characteristics of the generated topic, it was classified appropriately into one of three socio-ecological levels (individual, interpersonal, and community). In this study, a total of 8 themes were derived, including 3 themes at the personal level (exercise 1, stress management 1, and self-checking 1), 1 theme at the interpersonal level, and 4 themes at the community level

(common topic 1, exercise 1, stress management 1, and self-checking 1). To enhance the qualitative research validity, we applied the criteria of credibility, transferability, dependability, and confirmability [25]. The researchers worked hard to bracket their expertise and preconceived notions throughout the research process to confirm and share each other's opinions through continuous discussions. Result reporting was performed following the consolidated criteria for reporting qualitative research checklist [26].

2.6. Ethical Consideration. This study was approved by the Institutional Review Board of Changwon National University to which the researcher belongs (IRB no. 7001066-202105-HR-021).

3. Results

3.1. General Characteristics of the Participants. Regarding the general characteristics of the participants, 62.4% were female and over 60% were in their 70s or older. For type of family, 41.3% lived alone and 36.7% lived as a couple. The overall level of education was low, with 65.1% of the participants graduating from elementary school or lower. More than 60% of the residents have lived in the village for more than 25 years, and the most common underlying diseases were arthritis (44.0%) and hypertension (38.5%) (Table 1).

3.2. Socio-Ecological Factors and the Degree of CVD Preventive Behavior Practice. Among the socio-ecological factors, self-efficacy, an individual aspect, showed an average score of 3.09. Among the interpersonal aspects, the average score for social support was 3.62, and the average score for sense of community was 3.68. The average score for CVD preventive behavior was 3.39, and among the subdomains, smoking, eating habits, and drinking were high at 4.24 points, 4.12 points, and 4.11 points, respectively, and exercise, stress, and examination were low at 2.01 points, 2.51 points, and 2.92 points, respectively (Table 2).

3.3. Correlation between Socio-Ecological Factors and the Degree of CVD Preventive Behavior Practice. The correlation analysis between socio-ecological factors and CVD preventive behavior practice revealed that as self-efficacy, a personal aspect, increases, sleeping scores also increase ($r=0.20$ and $p=0.04$). In terms of interpersonal aspects, if family support, compared to social support, is high, the smoking cessation score increases ($r=0.29$ and $p<0.001$) while sleeping score decreases ($r=-0.23$ and $p=0.02$). Additionally, the stress management score increased when the support of significant others was high ($r=0.24$ and $p=0.01$). In terms of interpersonal aspects, sense of community did not show a significant correlation with the degree of CVD preventive behavior practice (Table 3).

3.4. Obstacles to CVD Preventive Behaviors. Among seven subdomains of CVD preventive behavior, exercise, stress management, and self-checking were evaluated at a lower level compared with other subdomains. Accordingly, in-depth interviews were conducted considering the socio-ecological aspects of the factors that made health behavior difficult in these three subdomains (Table 4).

3.4.1. Personal Aspect. Five themes were derived as obstacles in the personal aspect: one for self-checking, two for exercise, and two for stress management.

The one theme that made it difficult for an individual to exercise was "body condition being dominated by labor." Research participants cited hard labor as the primary cause of difficulty in exercising. They typically work in paddies and fields near their house, perceive labor, and exercise as being at the same level of physical activity and said they had no time to exercise because they are working, which is akin to physical activity. Most were older adults and said they were too tired to exercise after work.

"I work everyday in the village, and that's exercise. I have no time to work out because I'm too busy." (G1 P3)

"It is 7:30 p.m. when we get home. Even if we get home at 7 p.m., it becomes 8 p.m. by the time we have dinner. Then, when can I go work out? It's time for bed." (G2 P1)

"Whether we are tending the vegetable garden or anything else, when we come home we're exhausted. Even if we have time, we are so tired and tend to just lie down. We may stretch a little, but that is all. Our lifestyle makes it difficult to take time out to work out, whether walking or doing gymnastics." (G1 P1)

The one theme derived as reasons for why an individual is unable to manage stress is "stress due to absent or cohabiting family members." Most research participants are older adults whose sons and daughters live in cities, and many live alone after their spouses have passed away. Those living alone said they had no stress as they live alone but are lonely because they have no one to converse with. In contrast, those living with family said that the nagging of family members is a cause of stress.

"If there is some to confide in, a close friend or someone. I think it would be great to have someone to whom I can open up and talk, but there is no one like that. If we have someone who listens to what others say and sympathizes, even one person in the village, we'd be able to go to that person and talk about whatever happened to me that made me angry, and the person will listen to me." (G2 P1)

"When we get stressed, we tend to relieve it with talking. My husband also gives me a lot of stress. His nagging gives me a lot of stress. Then, I just yell back and go back to the house." (G2 P2)

TABLE 1: General characteristics of participants.

		N (%)
Sex	Male	41 (37.6)
	Female	68 (62.4)
Age (Years)	60 or less	19 (17.4)
	61~70	20 (18.3)
	71~80	37 (33.9)
	81 and more	33 (30.3)
Family type	Single	45 (41.3)
	Couple	40 (36.7)
	With family	24 (22.0)
Education	Elementary school	71 (65.1)
	Middle school	11 (10.1)
	High school or more	27 (24.8)
Family income (Korean won)	Less than 500,000	66 (60.6)
	500,000~990,000	18 (16.5)
	1,000,000~1,999,999	19 (17.4)
	2,000,000 or more	6 (5.5)
Health insurance	National health insurance	102 (93.6)
	Medical aids	7 (6.4)
Residence duration (Years)	25 or less	36 (33.0)
	26~60	36 (33.0)
	61 and more	37 (33.9)
Basal disease	Hypertension	42 (38.5)
	Diabetes mellitus	17 (15.6)
	Hyperlipidemia	17 (15.6)
	Arthritis	48 (44.0)
	Back pain	36 (33.0)

(N=109).

“Lack of knowledge about symptoms and self-checking methods” was cited as the reasons for difficulty in self-checking. Participants delayed their health check-ups when they had no symptoms and visited a doctor when they became ill. Checking blood pressure or weight was not possible because they did not know how to or had no equipment.

“If it shows when we get sick, we will know, but it does not always show. So, we just put it on the back burner and let it go. We wait till we get sick symptoms. That is only when we know. Because it doesn’t show (in the beginning).” (G2 P3)

“We have to set a schedule and do it because it doesn’t show. We only know when we have a checkup. We never know without a checkup. There is no place to check at home. I’ll do it myself if it is easy to do it. Anyone can do it if it is easy.” (G2 P3)

3.4.2. *Interpersonal Aspect.* Interpersonal obstacles in practicing health behaviors, such as social support system or a sense of community, were difficult to divide into three subdomains and were classified as a common reason. The two themes include “more faithful to personal life than relationships with neighbors” and “sense of community is not the same as it was before.” The participants missed the old days, saying they have become distant from their neighbors. Nevertheless, they feel more comfortable

TABLE 2: Socio-ecological factors and CVD preventive behavior practice.

		Subdomain	Mean (SD)
Individual aspect	Self-efficacy		3.09 (0.92)
		Family	3.94 (0.83)
Interpersonal aspect	Social support	Friends	3.31 (1.02)
		Significant others	3.61 (0.84)
		Total	3.62 (0.73)
		Sense of fulfillment	3.54 (0.79)
SEM	Sense of community	Sense of solidarity	4.00 (0.76)
		Sense of belonging and mutual influence	3.57 (0.74)
Community aspect	Sense of community	Sense of emotional intimacy	3.72 (0.92)
		Total	3.68 (0.69)
CVD preventive behavior practice		Smoking cessation	4.24 (1.22)
		Abstain from drinking	4.11 (1.33)
		Physical exercise	2.01 (1.16)
		Healthy diet	4.12 (0.67)
		Stress management	2.51 (1.41)
		Sleeping	3.82 (1.29)
		Self-checking	2.92 (1.01)
		Total	3.39 (0.56)

CVD: cardiovascular disease.

practicing health behaviors alone than with their friends or neighbors. They prioritize caring for their paddies and fields over making an appointment to do something together. They expressed regret that the overall sense of community is declining, saying that, although there are women’s associations, senior citizens’ associations, and youth associations in the village, these organizations do not care well for the residents, and the number of residents gathering together has decreased significantly.

“The relationship between people is becoming distant. The relationship between neighbors is not the same as it used to be. In fact, they feel a little more distant. I lost some affection for the people in the neighborhood.” (G1 P1)

“Everyone is busy with their work as soon as they wake up. If we work close to each other, we may be able to do it but...” (G1 P3)

“Women’s associations are for meetings, in the village hall and something like that. Even the president of the women’s association can’t take care of every household.” (G2 P2)

“At the time, the villagers gather together, eat, and share a good time together, then we could talk, even for one day.”

TABLE 3: Correlation between socioecological factors and degree of cardiovascular disease preventive behavior practice.

CVD preventive behavior practice	Individual aspect			Interpersonal aspect			Community aspect							
	Self-efficacy			Social support			Sense of community							
	r	(p)		Family	Friends	Significant others	Sense of fulfillment	Sense of solidarity and mutual influence	Sense of belonging and mutual influence	Sense of emotional intimacy				
Smoking cessation	-0.11	(0.25)	0.29**	(<0.001)	0.04	(0.66)	0.18	(0.06)	0.03	(0.76)	0.03	(0.74)	0.12	(0.22)
Abstain from drinking	-0.17	(0.09)	0.13	(0.17)	-0.05	(0.57)	0.05	(0.60)	0.02	(0.86)	-0.05	(0.64)	-0.16	(0.10)
Physical exercise	-0.02	(0.86)	0.00	(0.99)	0.00	(0.99)	0.07	(0.50)	-0.03	(0.76)	-0.05	(0.59)	0.08	(0.42)
Healthy diet	-0.13	(0.17)	0.15	(0.12)	0.02	(0.87)	0.09	(0.37)	0.02	(0.83)	0.00	(0.97)	0.03	(0.78)
Stress management	0.16	(0.10)	0.15	(0.11)	0.07	(0.49)	0.24*	(0.01)	0.01	(0.90)	0.12	(0.23)	0.06	(0.52)
Sleeping	0.20*	(0.04)	-0.23*	(0.02)	0.03	(0.74)	0.03	(0.74)	0.05	(0.61)	0.03	(0.74)	0.13	(0.19)
Self-checking	0.02	(0.81)	0.09	(0.35)	-0.16	(0.09)	0.03	(0.79)	0.01	(0.89)	0.09	(0.34)	0.08	(0.42)

* $p < .05$; ** $p < 0.01$; CVD: cardiovascular disease.

TABLE 4: Barriers of the practice of cardiovascular disease preventive behavior in three subdomains.

SEM	Subdomain	Theme	Code
Personal level	Physical exercise	Body condition being dominated by labor	Recognizing labor as exercise Lack of physical exercise time due to working hours A body exhausted from labor
	Stress management	Stress due to absent or cohabiting family members	I do not even get stressed because I am living alone I have no one to talk to Unpleasant husband's nagging
	Self-checking	Lack of knowledge about symptoms or self-checking methods	I do not measure due to no self-awareness symptoms Do not know how to self-measure I do not have equipment to measure at home
Interpersonal level	Common	More faithful to personal life than with neighbors Sense of community that is not the same it was before	Growing estranged from the villagers It is hard to meet the time because we are busy doing our own work Even the village Women's association could not take care of the villagers Fewer opportunities for villagers to get together
	Exercise	An environment that hinder physical activity	It is hard to walk around because there is a lot of grass An uncomfortable and dangerous staircase for the elderly I do not walk around at night because it is dark and scary The villagers' center is mainly used by the elderly women
Community level	Stress management	Lack of space for older men to gather and talk	Old men sitting under the village pavilion because there was no place Examination is difficult because it is far from the public health clinic
	Self-checking	Low access to healthcare	Due to COVID-19, the working hours of the health clinic have been reduced, making it difficult to get a check-up After living in the city and coming to the countryside, low access to medical care prevents a check-up

SEM: socio-ecological model.

In those days, we took care of each other. But now it is difficult to take care of each other. When it was the birthday of a resident, or on occasions like that, the person shared with the villagers or something like that. But here these days, because of farming, and what should I say. (It's getting harder and harder to take care of each other.)" (G1 P1)

3.4.3. *Community Aspect.* A total of three themes were derived as obstacles in the community aspect, divided into one for exercise, one for stress management, and one for self-checking. The one theme for why exercise was difficult from the community perspective includes "an environment that hinders physical activity." The participants said that as few people are walking and moving around by car, the pedestrian road is overgrown with weeds and unorganized, making walking difficult, especially at night, because it can be dangerous.

"When we walk around, the sidewalk seems, what should I say. . . dangerous. The sidewalk is not exactly demarcated, and it is almost just overgrown with grass. There is a trail going up, but it is difficult for older people to climb the hill. There is a lot of grass there. And after it rains, I go up when I work out, but I'm always worried about ants or something coming out. Although they almost never came out these days. I walked to the county office a few times, and it's really dangerous to walk on that road." (G2 P3)

"I have to work as soon as I wake up. It is only when it rains hard that I don't work. But if it rains, who can go work out with the sporting equipment in the park? No one I know does even if they have the sporting equipment at home." (G1 P3)

The reason why stress management was problematic from the community perspective was "lack of space for older men to gather and talk," and the reason why self-checking was difficult was "low access to healthcare." In the target village, the villagers' center is perceived as a space mainly used by older women, and the older men complained that it was difficult to relieve stress because of lack of space for them to gather and talk to each other. They also complained that residents with difficulties in self-checking have to use a health center for a medical check-up, but if they live far from the health center, obtaining a check-up becomes difficult. Those who recently returned to the village reported that, after returning home, self-checking has become difficult, and the increased distance from medical institutions has decreased the frequency of health check-ups significantly.

"I saw old men when I came here; they were sitting side by side under the tree in the village. The older men in the village do not go up (to the villagers' center). They are so scared of this center that they can't come down. Ha-ha." (G2 P2)

"Checking my weight? No. Where can I do that? There is no place to do that at home. The community health center is too far away. Car? Do we have a car? No. I can check my weight when the director of the public health clinic comes over and does it for me. (Otherwise I can't.)" (G2 P1)

"This public health clinic is supposed to serve four villages. And it is said that it is extended to other areas, and one person manages the health (of all the residents). (With fewer villages in charge) it wouldn't be enough to provide better service than it is now. We're all South Korean citizens, but only those living in Seoul have advanced medical benefits, the health service in the countryside is shrinking." (G1 P1)

"I used to get a health checkup every year when I had a job in the city, but after I moved here, rural community, I didn't have check-up. I don't have a scale at home. I have a blood pressure gauge, and I have slightly low blood pressure, but I don't pay much attention and do not check my blood pressure regularly." (G2 P3)

4. Discussion

For quantitative research, smoking, drinking, and eating habits scored an average of 4 or higher, indicating good practice, while exercise, stress management, and self-checking scored less than 3 points on average, indicating that they are poorly practiced. The relationship between socio-ecological factors and CVD preventive behavior practice discussed by each level is summarized as follows:

First, among socio-ecological factors, self-efficacy, a personal aspect, showed a positive correlation with the sleep domain scores. Studies analyzing the relationship between self-efficacy and the widespread practice of health promotion behaviors for local older adults reported that self-efficacy positively influenced health promotion behaviors but did not analyze the direct relationship between self-efficacy and sleep [17]. This study's participants are middle-aged and older adults living in a rural community. Most of them do farm work and engage insignificant physical labor during the daytime. Self-efficacy is a significant predictor of low-complexity task performance [27], and fatigue causes sleep disorder [28]. Thus, older adults who perform manual work may have relatively high self-efficacy, and fatigue from physical work affects sleep as a pathway.

Second, among social support, an interpersonal aspect, family support showed a positive correlation with smoking cessation. In a study conducted on smokers with coronary artery disease in Korea, family support was reported as a significant factor influencing the intention and practice of smoking cessation [29]. Family support is a crucial factor in the successful aging of Korean older adults [30], and it was shown as an important variable in smoking cessation practice. Subsequently, the support of others, among social support, was positively correlated with stress management. Regarding the relationship between social support and stress, social support is perceived to have an indirect effect, acting as a moderator or mediator, although it may have a direct effect on stress relief [31]. This study's results showed that positive support from those other than family and friends, compared to social support, helped participants with stress management. Since over 60% of the study participants have lived in the village for 25 years or longer, there may be no clear distinction between friends and significant others for support. Thus, it seems appropriate to understand this broadly as support from the village's residents.

Finally, sense of community, the aspect of the local community among the socio-ecological aspects, did not show a significant correlation with the practice of CVD preventive behavior. A Canadian study reported that sense of community influences health behaviors, especially exercise, weight loss, and dietary improvement [32]. Lee, Kim, Choi, and Choi confirmed that sense of community indirectly affects healthy lives [33]. Those with a high sense of community may be more actively engaged in local community activities, providing changes in health promotion behaviors [34]. In contrast, Chung and Lim reported that the sense of community significantly affects other age groups when analyzing factors affecting Koreans' life satisfaction, but not the older adults group [35]. Recently, materialism has become widespread and mutual cooperation and reciprocity have become a burden on rural residents, deteriorating the sense of community [36]. Materialistic values value physical and economic stability, while nonmaterialistic values value human values such as freedom, environmental improvement, and human rights. As the importance of the value of dematerialism was emphasized, the village community movement became visible [37]. Therefore, placing more value on materialism means a decrease in the importance of human values, which can lead to a decrease in the sense of community.

Subsequently, through qualitative research, among the personal aspects, the perception of prioritizing work and lack of exercise habits were confirmed as obstacles to exercise practice. Highly intensive labor, such as farming, adversely affects older adults' health [38]. However, the participants have been exposed to extended labor hours to make a living, and labor has become a part of their lives. Because of fatigue from labor, they do not consider exercising, leading to a lack of this habit. Therefore, the older adults in rural communities must be educated about the importance of rest during labor and suggest ways to exercise, such as a walk in the morning, considering the environment and the routine of the farming village. Regarding stress management, they reported loneliness, lack of someone to speak with, and nagging from family members when they live with family. The leading cause of their complaints of loneliness may be associated with the increase in the number of older adults living alone. In Korea, the proportion of older adults living alone is increasing rapidly, with 41.3% of the participants living alone. Older adults living alone may have higher depression and suicidal thoughts than those living with someone [39]. Thus, we need to actively develop programs to manage depression and stress for the increasing older adult population. Among personal aspects, participants cited lack of detectable symptoms and knowledge about self-measurement as the primary reason not to practice self-measurement among personal aspects. According to a survey on the knowledge of CVD among older adults in Korea, the score was 3–5 out of 10, lower than approximately 7 for adults in their 40s and 50s [16]. An easily understandable educational program on CVD symptoms for older adults must be urgently developed.

Participants said they had become more faithful to their individual lives than to their relationships with the village residents and did not feel the need to prioritize spending time together. Additionally, they said that the sense of

community was not the same as before, and the activities with the residents had significantly reduced. Since the residents with a high sense of community are more likely to be engaged in community activities [34], an atmosphere where the residents become more individualized and the sense of community decreases can pose an obstacle to the practice of health promotion behavior together among the residents. For the past ten years, Korea has been working on expanding health promotion projects led by the residents [40]. However, public organizations lead health projects in most cases, and whether the resident participatory health promotion project is being accurately implemented must be evaluated.

Regarding community aspects, participants reported environmental problems as the main obstacle. Regarding exercise, older adults complained of inconvenience in walking because the sidewalks were overgrown with grass, the stairs were not well-maintained, and there were no street lights at night. The public health clinic is mainly used by local residents living close to it, and recently the hours of operation have reduced due to the coronavirus disease 2019 pandemic, making it difficult for them to get their blood pressure or blood sugar checked regularly at the public health clinic. Previous study showed that the physical environment influences the health of older adults [41]. Age-friendly design should be introduced to improve the residential environment and develop pedestrian roads [42]. Public health clinics in South Korea are primary healthcare institutions responsible for essential health care for residents of vulnerable areas [43]. However, an increasingly large number of rural residents own a car, and most older adults with chronic illnesses go to the doctor's clinic. Due to these changes, the function of public health clinics as primary healthcare institutions is gradually weakening [43]. In addition, it was further weakened as personnel in the public health clinic were mobilized for quarantine job due to COVID-19. Unlike doctors' clinics, public health clinics are the institutions provided by the public sector, their role should be strengthened by continuing efforts to develop essential medical services and health promotion programs that residents can actively participate in.

Only, approximately, 100 residents participated in this study, limiting the quantitative analysis of response results. Nevertheless, the number of surveyed residents represents the residents living in the village, and the reasons for the quantitative research results could be analyzed and understood in-depth by conducting qualitative and quantitative research.

5. Conclusion

The result showed that the residents of the target village had a low level of practice in three subdomains of exercise, stress management, and self-checking, among the seven subdomains of CVD preventive behaviors. According to a qualitative study results, the following contents were identified as obstacles in three dimensions. At the personal level, overwork, loneliness, and lack of knowledge about CVD; at the interpersonal and community level, decreased activities with residents due to increased individualistic

tendencies and decreased community consciousness; and at the community environmental level, inconvenience of sidewalks, lack of community space, and insufficient functioning of village health clinics. In order to reduce obstacles to health behavior practice to prevent cardiovascular disease, multidimensional efforts are needed in terms of socio-ecological aspects.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Additional Points

What This Paper Adds? Not only factors affecting health behavior practice but also the factors that are obstacles were analyzed in multidimensions using the socio-ecological model. The results of this study can be used for various strategies development such as environmental improvement as well as education program for practicing health promotion behavior. *What is Already Known on This Subject?* As in previous studies, it was confirmed that self-efficacy, which is a personal aspect, is a variable that shows a high relationship with health promotion behavior practice.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This study was financially supported by the National Research Foundation of Korea (no. 2020R1A2C1008591) and funded by Qualitative Excellent Thesis Support Project at Changwon National University in 2023.

References

- [1] World Health Organization, "WHO reveals leading causes of death and disability worldwide: 2000-2019," 2020, <https://www.who.int/news/item/09-12-2020-who-reveals-leading-causes-of-death-and-disability-worldwide-2000-2019>.
- [2] Statistics Korea, *Causes of Death Statistics in 2020*, Korea National Statistical Office, Annual report on the cause of death statistics in 2022, 2023, Daejeon, South Korea, 2021, <https://kosis.kr/search/search.do>.
- [3] A. Viridis, C. Giannarelli, M. Fritsch Neves, S. Taddei, and L. Ghiadoni, "Cigarette smoking and hypertension," *Current Pharmaceutical Design*, vol. 16, no. 23, pp. 2518–2525, 2010.
- [4] A. Grillo, L. Salvi, P. Coruzzi, P. Salvi, and G. Parati, "Sodium intake and hypertension," *Nutrients*, vol. 11, no. 9, p. 1970, 2019.
- [5] World Health Organization, *Preventing Chronic Diseases: A Vital Investment: WHO Global Report*, World Health Organization, Geneva, Switzerland, 2005.
- [6] Korea Center for Disease Control & Prevention, *Lack Of Preventive Management Level Of Cardiovascular Disease*, KCDC, Chungcheongbuk-do, South Korea, 2022.
- [7] E. P. Havranek, M. S. Mujahid, D. A. Barr et al., "Social determinants of risk and outcomes for cardiovascular disease: a scientific statement from the American Heart Association," *Circulation*, vol. 132, no. 9, pp. 873–898, 2015.
- [8] K. R. McLeroy, D. Bibeau, A. Steckler, and K. Glanz, "An ecological perspective on health promotion programs," *Health Education Quarterly*, vol. 15, no. 4, pp. 351–377, 1988.
- [9] M. J. Kim and E. Park, "The prevalence and the related factors of metabolic syndrome in urban and rural community," *Korean Journal of Adult Nursing*, vol. 26, no. 1, pp. 67–77, 2014.
- [10] Ministry of Health & Welfare & Korea Center for Disease Control & Prevention, "Korea health statistics 2016: Korea national health and nutrition examination survey (KNHANES VII-1)," 2016, <https://knhanes.cdc.go.kr/knhanes/index.do>.
- [11] Korea Institute for Health and Social Affairs, *A Survey on the Needs of Long-Term Care for the Older Adults and a Study on Policy Measures*, Korea Institute for Health and Social Affairs, Sejong City, South Korea, 2001.
- [12] Y. E. Jang and S. Y. Kim, "Age-friendly socio-economic environment's effect on the life satisfaction of rural older adults," *Region and World*, vol. 38, no. 3, pp. 255–284, 2014.
- [13] S. J. Kim, "A study of physical health, mental health, and social health of the older adults," Unpublished master's thesis, Hanseo University Graduate School, Chungcheongnam-do, South Korea, 2012.
- [14] T. Nag and A. Ghosh, "Cardiovascular disease risk factors in Asian Indian population: a systematic review," *Journal of Cardiovascular Disease Research*, vol. 4, no. 4, pp. 222–228, 2013.
- [15] H. Ueshima, A. Sekikawa, K. Miura et al., "Cardiovascular disease and risk factors in Asia: a selected review," *Circulation*, vol. 118, no. 25, pp. 2702–2709, 2008.
- [16] J. H. Cho, "Relationship between health concern, knowledge of cardio-cerebrovascular disease, and health-promoting behaviors among the older adults," *The Journal of Korean Academic Society of Home Care Nursing*, vol. 28, pp. 144–153, 2021.
- [17] H. J. Choi and J. H. Yoo, "The effect of depression and self-efficacy on health promotion behavior among the older adults living alone in rural area," *Journal of East-West Nursing Research*, vol. 17, no. 2, pp. 149–155, 2011.
- [18] L. Doyle, A. M. Brady, and G. Byrne, "An overview of mixed methods research – revisited," *Journal of Research in Nursing*, vol. 21, no. 8, pp. 623–635, 2016.
- [19] H. B. Bosworth, L. A. Bastian, M. N. Kuchibhatla et al., "Depressive symptoms, menopausal status, and climacteric symptoms in women at midlife," *Psychosomatic Medicine*, vol. 63, no. 4, pp. 603–608, 2001.
- [20] G. Chen, S. M. Gully, and D. Eden, "Validation of a New general self-efficacy scale," *Organizational Research Methods*, vol. 4, no. 1, pp. 62–83, 2001.
- [21] G. D. Zimet, N. W. Dahlem, S. G. Zimet, and G. K. Farley, "The multidimensional scale of perceived social support," *Journal of Personality Assessment*, vol. 52, no. 1, pp. 30–41, 1988.
- [22] D. W. McMillan and D. M. Chavis, "Sense of community: a definition and theory," *Journal of Community Psychology*, vol. 14, no. 1, pp. 6–23, 1986.
- [23] H. J. Park, "Effect of lifestyle improvement education program on knowledge, attitude and behavior related to brain CVD prevention of small and medium-sized workplace workers," Master's Thesis, Dongguk University Graduate School, Seoul, South Korea, 2008.

- [24] S. Elo and H. Kyngäs, "The qualitative content analysis process," *Journal of Advanced Nursing*, vol. 62, no. 1, pp. 107–115, 2008.
- [25] Y. S. Lincoln and E. G. Guba, *Naturalistic Inquiry*, Sage Publications, Newbury Park, CA, USA, 1985.
- [26] A. Tong, P. Sainsbury, and J. Craig, "Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups," *International Journal for Quality in Health Care*, vol. 19, no. 6, pp. 349–357, 2007.
- [27] T. A. Judge, C. L. Jackson, J. C. Shaw, B. A. Scott, and B. L. Rich, "Self-efficacy and work-related performance: the integral role of individual differences," *Journal of Applied Psychology*, vol. 92, no. 1, pp. 107–127, 2007.
- [28] A. N. Mariman, D. P. Vogelaers, E. Tobback, L. M. Delesie, I. P. Hanoulle, and D. A. Pevernagie, "Sleep in the chronic fatigue syndrome," *Sleep Medicine Reviews*, vol. 17, no. 3, pp. 193–199, 2013.
- [29] H. M. Son and E. Lee, "Effects of family support and quality of life in relation to smoking cessation in male patient with coronary artery disease," *Journal of the Korean Academy of Fundamentals of Nursing*, vol. 15, no. 1, pp. 71–79, 2008.
- [30] S. Y. Han and S. N. Yun, "Successful aging and the influencing factors in the Korean older adults: focused on family support," *Journal of Korean Academy of Community Health Nursing*, vol. 26, no. 4, pp. 372–379, 2015.
- [31] P. A. Thoits, "Stress, coping, and social support processes: where are we? What next?" *Journal of Health and Social Behavior*, vol. 35, pp. 53–79, 1995.
- [32] P. Hystad and R. M. Carpiano, "Sense of community-belonging and health-behaviour change in Canada," *Journal of Epidemiology & Community Health*, vol. 66, no. 3, pp. 277–283, 2012.
- [33] H. Lee, M. S. Kim, S. Choi, and M. Choi, "Eco-Systematic analysis on the factors related to the Korean elderly suicide ideation," *Health and Social Welfare Review*, vol. 34, no. 3, pp. 430–451, 2014.
- [34] M. Lee and M. Kang, "The impact of sense of community and concern for health on community participation in health promotion in a medium-sized Korean city," *Korean Journal of Health Education and Promotion*, vol. 37, no. 5, pp. 37–50, 2020.
- [35] S. Chung and J. S. Lim, "The effects of age-friendly environments on life satisfaction: mediating effects of sense of community and multiple-group analysis," *Health and Social Welfare Review*, vol. 41, no. 1, pp. 127–145, 2021.
- [36] H. Lee, "Is social capital the necessary condition for rural development?" *Korean Association of Regional Sociology*, vol. 21, no. 3, pp. 191–226, 2020.
- [37] R. Inglehart, *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*, Princeton University Press, Princeton, NJ, USA, 1997.
- [38] J. Chun, S. Ryu, M. A. Han, and J. Park, "Comparisons of health status and health behaviors among the elderly between urban and rural areas," *Journal of Agricultural Medicine and Community Health*, vol. 38, no. 3, pp. 182–194, 2013.
- [39] S. I. Nam, J. See, Y. Jung, and J. Chae, "Meaning in life, depression, and suicidal ideation in old age: a comparative study of living alone and not living alone older adults," *Korean Journal of Gerontological Social Welfare*, vol. 74, no. 2, pp. 163–192, 2019.
- [40] D. Lee, C. Kim, Y. Lee et al., "The fruits and the limitations of Seoul's community-based participatory health program of "Building Healthy Communities," *Health and Social Welfare Review*, vol. 42, no. 1, pp. 316–334, 2022.
- [41] N. Garin, B. Olaya, M. Miret et al., "Built environment and elderly population health: a comprehensive literature review," *Clinical Practice and Epidemiology in Mental Health*, vol. 10, no. 1, pp. 103–115, 2014.
- [42] Y. J. Joung and S. K. Lee, "The study on the causality among built environment, social relationship, and health of the older adults," *Journal of The Korean Regional Development Association*, vol. 27, pp. 75–94, 2015.
- [43] E. S. Lim, C. Kwak, and K. Lee, "A study on re-establishing the functions of health clinics and strengthening health promotion projects," *Ministry of Health and Welfare, National Library of Korea Link Data*, vol. 5, 2016.