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Determinants of the Health-Promoting Behaviors Among Community-Dwelling Older Adults with Non-communicable Diseases During the Post-Covid-19 Era

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Abstract

Background: While research has explored the health-promoting behaviors (HPBs) of older adults on a global scale during the first and second waves of COVID-19, there is limited knowledge about the factors that influence HPBs among older adults with non-communicable diseases (NCDs) in the "new normal" following the COVID-19 era.

Objectives: The aim of this study was to identify the factors that affect HPBs among community-dwelling older adults with NCDs.

Methods: This cross-sectional study involved surveying 250 older adults with NCDs in both urban and rural communities within Ubon Ratchathani province, northeast Thailand, between September 10 and November 10, 2022, during the COVID-19 pandemic. Data collection was conducted using a self-administered questionnaire, which included the Self-rated Abilities Scale for Health Practice, Health Literacy Scale, Access to COVID-19 Preventive Material, Lubben Social Network Scale, and Health-Promoting Behaviors Scale. The analysis utilized descriptive statistics and hierarchical regression analysis, setting the significance level at $P < 0.05$ for all analyses.

Results: Among the 250 older adults with NCDs surveyed, 65.60% had hypertension. These individuals demonstrated HPBs at a good level, along with a high level of perceived self-efficacy, good health literacy, adequate access to COVID-19 preventive materials, and greater social engagement. The analysis indicated that perceived self-efficacy ($\beta = 0.343$, $P < 0.001$), attitudes towards smoking ($\beta = 0.226$, $P < 0.001$), age ($\beta = 0.204$, $P < 0.001$), health literacy ($\beta = 0.199$, $P = 0.016$), and access to COVID-19 preventive materials ($\beta = 0.123$, $P = 0.026$) were significant predictors of HPBs in older adults with NCDs.

Conclusions: The results suggest that improved access to COVID-19 preventive materials, enhanced health literacy, and increased self-efficacy contribute to better health-promoting behaviors among older adults with NCDs. Multidisciplinary healthcare teams should consider these factors in their intervention strategies to achieve a deeper understanding and better health outcomes. Future research should investigate the causal relationships among these variables and examine older adults' perceptions of HPBs in long-term care settings, particularly in the "new normal" era.

Keywords: Health Behavior, COVID-19, Aged, Non-communicable Diseases, Self-efficacy

1. Background

Coronavirus disease 2019 (COVID-19), a new strain of coronavirus, was discovered in Wuhan, China, at the end of December 2019, and the disease rapidly spread across the globe (1). The number of new confirmed cases, deaths, and rehospitalizations due to COVID-19 continues to increase every day. As of December 24, 2023, there had been 773,119,173 confirmed cases worldwide, resulting in 6,990,067 deaths, with a cumulative total of 4,761,781 confirmed cases and 34,514 deaths in Thailand (2). Older adults, particularly those with NCDs such as diabetes and cardiovascular issues, face higher risks of COVID-19 infection with severe outcomes (3). As of January 18, 2024, Thai adults aged 60 and above recorded 170,861 confirmed cases (4). The COVID-19 crisis has impacted various aspects of life, including the economy, society, happiness, and the physical and

psychological well-being of individuals since its onset (5-7).

As a result of the COVID-19 pandemic outbreak, people worldwide are currently experiencing stress and suffering (8). Despite the development of vaccines to prevent its spread and infection, the number of COVID-19-related deaths and infections in some countries continues to rise. Moreover, the number of COVID-19 mutations is high (Alpha, Beta, Gamma, Delta, and Omicron variants), with the strain capable of evading immunity acquired through vaccination, making it easily bypass an individual's humoral immune response (9), particularly in older adults with NCDs. However, several countries, including Thailand, have also attempted to prevent and control the spread of COVID-19 by promoting health behaviors (e.g., hand-washing, mask-wearing, social distancing, self-isolation, avoiding crowded places, and vaccination) (8). Consequently, under the critical condition of the "new normal" post-COVID-19 era, good health-promoting behavior for older adults is essential for self-care and disease prevention.

The term "new normal" has become a buzzword to describe the anticipated changes in human life worldwide due to the impact of COVID-19 (10). This "new normal" era necessitates that individuals modify their behaviors and lifestyles to prevent COVID-19 infection (11). For example, telemedicine has been used to address the challenges associated with in-person follow-up for older adults with NCDs during the COVID-19 pandemic, leading to its global adoption (12). However, changes in behavior during the "new normal" may occur due to a sustained and prolonged epidemic, which may affect health-promoting behaviors (HPBs), reducing the effectiveness of COVID-19 control and the maintenance of happiness and well-being in older adults with NCDs (13). Additionally, these behaviors affect an individual's health, such as seeking health information, engaging in physical activities, adhering to a healthy diet, obtaining adequate sleep, establishing healthy relationships, and developing disease sensitivity (14). These behaviors are of utmost importance because they prevent diseases, reduce pathogens, enhance the quality of life, and reduce the healthcare burden in societies (15).

Several studies have examined the factors associated with HPBs in various populations during the first and second waves of the COVID-19 pandemic, including hospitalized patients (16, 17), older adults (18-20), students (5), and health volunteers (21). They found that individuals with higher perceived self-efficacy (18), good health literacy (19), access to COVID-19 preventive materials (21), and strong social networks (16, 18) were more likely to engage in HPBs. However, understanding the factors influencing HPBs among community-dwelling older adults with NCDs in the "new normal" post-COVID-19 era is crucial for developing health promotion guidelines, particularly to curb the spread of emerging infectious diseases. It underscores that older adults with NCDs face a heightened infection risk compared to other age groups. In the context of inadequate health literacy, diminished perceived self-efficacy, and suboptimal HPBs, individuals within this demographic are rendered more susceptible to contagion from close contacts, including family members and others in their immediate environment (19). Social support exerts a substantive influence on the comprehension and adoption of self-care regimens and health behaviors among older adults (16). This influence assumes heightened importance amidst the backdrop of the COVID-19 pandemic, wherein constraints on the accessibility of trustworthy informational outlets can rapidly mold their behavioral patterns (8). Hence, guaranteeing the availability of COVID-19 preventive resources for older adults emerges as a matter of utmost significance (19), encompassing facilitating access to indispensable health-related guidance encompassing facets such as physical exercise, dietary practices, preventive protocols, and vaccination initiatives (21). More research is needed to explore the associations between sociodemographic characteristics, perceived self-efficacy, health literacy, access to COVID-19 preventive material, social networks, and HPBs among community-dwelling older adults with NCDs during the "new normal" post-COVID-19 era. Consequently, there exists a pressing imperative to comprehensively grasp the determinants underlying HPBs among community-dwelling Thai older adults afflicted with NCDs within the post-COVID-19 "new normal" milieu. As stewards of healthcare provision, it behooves nursing professionals and interdisciplinary healthcare teams to conscientiously recognize and comprehend prevailing power dynamics and their consequential impact on individual health behaviors. This understanding should inform the strategic formulation and execution of interventions aimed at bolstering HPBs among Thai older adults grappling with NCDs, thereby facilitating their adaptive response to the exigencies of the contemporary era characterized by the "new normal."

2. Objectives

The present study aimed to examine the relationships between sociodemographic characteristics, perceived self-efficacy, health literacy, access to COVID-19 preventive material, social networks, and HPBs among community-dwelling older adults with NCDs during the "new normal" post-COVID-19 era.

3. Methods

3.1. Research Design and Sampling

A descriptive cross-sectional research design was employed in both urban and rural communities in a province in northeast Thailand. This study involved recruitment from September 10th to November 10th, 2022, a period coinciding with the COVID-19 pandemic. It involved older adults with NCDs diagnosed by a physician. Multi-stage random and simple random sampling were used to recruit participants. In the first stage, 25 districts and 219 subdistricts classified in Ubon Ratchathani province were included. Thus, one district with three subdistricts (urban and rural communities) was included in the study. In the second stage, we used simple random sampling to select the participants. A total of 134 communities from one subdistrict considered an urban community and subdistricts considered rural communities by classifying the residential areas were included at this stage. In the final stage, 10 communities were randomly selected from both residential areas. We included potential participants if they: (a) Were both females and males aged 60 years or over, (b) were people who have one or more NCDs (i.e., heart disease, vascular disease, diabetes, hypertension, cancer, chronic obstructive pulmonary disease, and obesity), (c) were people living in the Ubon Ratchathani province during the COVID-19 pandemic, and (d) could read, understand, and communicate in Thai. Cognitive screening measures were applied to assess participants' orientation towards place, person, and time. Those who were able to provide coherent responses were deemed eligible for inclusion in the study. Participants who had other abnormalities (e.g., visual, sensory, or auditory) and were unable to participate were excluded from this study. We used G*Power software version 3.1.9 (22) to determine a suitable sample size using the effect size based on previous studies, which was 0.15 (16, 23), with an alpha level of 0.05 and a power of 0.80. To prevent incomplete questionnaires and missing data, we added another 30% to the number of participants. Consequently, the final sample size was 250 older adults with NCDs. We explained to participants how to accomplish the questionnaires and also allowed them to ask questions thereafter. Then, we asked them to complete a one-time self-reported questionnaire.

In case participants requested assistance, the researchers read aloud each item of the questionnaires to the participants, who independently rated the item. It took approximately 30 -40 minutes to complete the questionnaire.

3.2. Instruments

Self-rated Abilities Scale for Health Practice (SRAHP): The SRAHP (24) can measure self-efficacy for HPBs regarding the "new normal" era of the COVID-19 pandemic. It has been widely used among Thai individuals with NCDs (16, 25). The SRAHP comprises 28 items with four subscales: Nutrition, stress management, exercise, and health practice. An example of one item on the SRAHP is “Find healthy foods that are within my budget.” Each subscale consists of seven items, and responses were to be provided on a 5-point scale, with “0” indicating not at all and “4” indicating completely, with a total score ranging from 0 to 112, where higher scores indicate higher self-efficacy. Raw scores were divided into 3 levels: Low level (0 - 37), moderate level (38 - 74), and high level (75 - 112). In the current study, the Cronbach’s alpha coefficient of the SRAHP for the entire scale was 0.95, and for each subscale, it ranged from 0.82 to 0.90.

Health Literacy Scale (HLS): The HLS measures health literacy among older adults with NCDs and was originally developed in Thai (26). The HLS is a 10-item questionnaire with a single dimension. An example of one item on the HLS is “You plan activities necessary for your good health.” Responses are given on a 5-point rating scale, with scores ranging from 1 = strongly disagree to 5 = strongly agree. The total score ranges from 10 to 50, with higher scores indicating higher health literacy. Raw scores were divided into four levels: Bad level (10 - 20), fair level (20 - 29), good level (30 - 39), and very good level (40 - 50). In the current study, the Cronbach’s alpha coefficient of the HLS for the entire scale was 0.90.

Access to COVID-19 Preventive Materials (ACPMS): The ACPMS measures how older adults with NCDs access COVID-19 preventive materials in the "new normal" era of the COVID-19 pandemic. The ACPMS was originally developed in Thai (19) and comprises a 5-item questionnaire with a single dimension: “(1) Access to alcohol-based hand rub, (2) access to free masks, (3)

access to buy alcohol-based hand rub or soap, (4) access to free alcohol-based hand rub or soap, and (5) access to COVID-19 preventive materials (e.g., face shields)." An example of one item on the ACPMS is "You can buy a face mask." Responses are given on a 3-point rating scale, ranging from 0 = no or not sure to 1 = yes, with a total score ranging from 0 to 5, where higher scores indicate higher access to COVID-19 preventive materials. Raw scores were divided into two levels: Bad level (0 - 2) and good level (3 - 5). In the current study, the Cronbach's alpha coefficient of the ACPMS for the entire scale was 0.76.

Lubben Social Network Scale (LSNS-6): The LSNS-6 measures the loneliness and social isolation of older adults with NCDs in the "new normal" era of the COVID-19 pandemic. The LSNS-6 was originally developed in English (27) and has been widely used among Thai older adults (28, 29). This questionnaire comprises 6 items and contains two subscales: Family and friendships. An example of one item on the LSNS-6 is "How many relatives do you see or hear from at least once a month?" Responses are given on a 6-point rating scale, ranging from 0 = none to 5 = nine or more, with the total score ranging from 0 to 30, where higher scores indicate more social engagement. In the current study, Cronbach's alpha coefficient of the LSNS-6 was 0.88.

Health-Promoting Behaviors Scale (HPBS): The HPBS measures the HPBs of older adults with NCDs in the "new normal" era of the COVID-19 pandemic. The HPBS was originally developed in Thai (26) with 19-item questionnaires and comprises seven subscales: (1) Nutrition, (2) exercise, (3) smoking, (4) alcohol drinking, (5) stress management, (6) rational drug use, and (7) preventive COVID-19 infection. An example of one item on the HPBS is "You eat clean and cooked food." Responses are given on a 5-point rating scale, ranging from 1 = not at all to 5 = completely, with the total score indicating higher HPBs. Raw scores were divided into four levels: Bad level (< 58.80), fair level (58.81 - 60.19), good level (60.20 - 68.79), and very good level (> 68.80). In the current study, the Cronbach's alpha coefficient of HBPS for the entire scale was 0.75, and for each subscale, it ranged from 0.73 to 0.83.

Sociodemographic Questionnaire: The sociodemographic information included 17 multiple-choice or open-ended questions, consisting of sex, age, weight, height, education, current occupation, marital status, income, type of NCDs, comorbidity, health care coverage, perceived smoking, perceived alcohol drinking prior to the COVID-19 pandemic, perceived physical and mental health status, and perceived sleep quality and exercise prior to the COVID-19 pandemic.

3.3. Ethical Considerations

The research protocol for this study received ethical approval from the Institutional Review Board of Krirk University (protocol code 0204/001, dated July 1, 2022) and the Institutional Review Board of Ubon Ratchathani Provincial Health Office (protocol code SSJ.UB 2565-115, dated September 9, 2022). Following the provision of both verbal and written instructions, all participants provided explicit informed consent to engage in the study. Stringent measures were implemented to safeguard patient confidentiality, with identities remaining undisclosed to maintain the confidentiality and integrity of the collected data.

3.4. Data Analyses

All statistical analyses were performed using IBM SPSS 25.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to analyze the sociodemographic data, displaying frequency, percentages (%), mean scores, and standard deviation (SD). Additionally, hierarchical regression analysis was used to determine the predictability factors of HPBs among older adults with NCDs. All assumptions of normality, multicollinearity, linearity, and autocorrelation were met. The significance level was set at $P < 0.05$ for all analyses.

4. Results

4.1. Characteristics of Participants

Of the 250 participants in the study, 63.60% were female (n = 159). The average age was 69.61 years (7.47), and 132 (52.80%) were aged 60 - 69 years. Table 1 summarizes the demographic characteristics of the participants.

Table 1. Participants' Demographic Data

Characteristics	No. (%)
Sex	
Female	159 (63.60)
Male	91 (36.40)
Age (y): Mean ± SD = 69.61 ± 7.47, Max = 95, Min = 60	
60 - 69	132 (52.80)
70 - 79	88 (35.20)
> 80	30 (12.00)
Body mass index (Kg/m^2): Mean ± SD = 23.43 ± 3.84	

< 18.5	13 (5.20)
18.5 - 22.9	95 (38.00)
23.0 - 24.9	74 (29.60)
25.0 - 29.9	51 (20.40)
> 30	17 (6.80)
Education level	
Primary school or lower	166 (66.40)
High school	58 (23.20)
Undergraduate	19 (7.60)
Graduate	7 (2.80)
Current occupation	
Agriculture	84 (33.60)
Homemaker	42 (16.80)
General employee	27 (10.80)
Government employee	24 (9.60)
Business	36 (14.40)
Retired	37 (14.80)
Marital status	
Never married/Single	39 (15.60)
Married	138 (55.20)
Widowed	69 (27.60)
Divorced/ Separated	4 (1.60)
Monthly income (US dollars): Mean ± SD = 132.14 ± 239.20	
< 143	207 (82.80)
144 - 286	20 (8.00)
286 - 429	6 (2.40)
> 430	17 (6.80)
Type of NCDs	
Heart disease (Yes)	20 (8.00)
Vascular disease (Yes)	23 (9.20)
Diabetes (Yes)	113 (45.20)
Hypertension (Yes)	164 (65.60)
Cancer (Yes)	2 (0.80)
Chronic obstructive pulmonary disease (Yes)	3 (1.20)
Obesity (Yes)	11 (4.40)
Comorbidity (Yes)	186 (74.40)
Health care coverage	
Universal health coverage	201 (80.40)
Social security scheme	7 (2.80)
Civil Servant Medical Benefit Scheme	41 (16.40)
Private health insurance	1 (0.40)

4.2. Levels of Perceived Smoking, Alcohol Drinking, Sleep Quality, Exercise, Physical Health, and Mental Health Status

As shown in Table 2, 88.4% (n = 221) of the participants did not smoke, and 8.0% were currently smoking the same amount as before the COVID-19 pandemic. A majority of participants did not consume alcohol (84.4%, n = 212), and 7.60% were currently consuming alcohol at the same level as before the pandemic. Regarding sleep quality, 91.2% (n = 228) of participants perceived it as unchanged, while 5.60% perceived their sleep quality to be worse than before the COVID-19 pandemic. When it comes to exercise, 84.0% (n = 210) of participants reported maintaining their usual level of activity compared to before the pandemic. Additionally, 60.80% of participants perceived their physical health status as good and 34.0% as fair, while their perceived mental health status was reported as good by 63.20% and fair by 32.00%.

Table 2. Participants' Levels of Perceived Smoking, Alcohol Drinking, Sleep Quality, Exercise, Physical Health, and Mental Health Status

Characteristics	No. (%)
Perceived smoking	
No smoke	221 (88.40)
Less than before COVID-19 pandemic	3 (1.20)
Same	20 (8.00)
More than before COVID-19 pandemic	6 (2.40)
Perceived alcohol drinking	
No drink alcohol	212 (84.80)
Less than before COVID-19 pandemic	17 (6.80)
Same	19 (7.60)
More than before COVID-19 pandemic	2 (0.80)
Perceived sleep quality	
Less than COVID-19 pandemic	14 (5.60)
Same	228 (91.20)
More than COVID-19 pandemic	8 (3.20)
Perceived exercise	
Less than COVID-19 pandemic	35 (14.00)
Same	210 (84.00)
More than COVID-19 pandemic	5 (3.20)
Perceived physical health	
Good	152 (60.80)
Fair	85 (34.00)
Bad	13 (5.20)
Perceived mental health	
Good	158 (63.20)
Fair	80 (32.00)
Bad	12 (4.80)

4.3. Levels of Perceived Self-efficacy, Health Literacy, Access to COVID-19 Preventive Material, and Social Networks

As shown in Table 3, participants demonstrated a high level of perceived self-efficacy (n = 143, mean = 76.48, SD = 17.55) across each subscale. The areas of nutrition, stress management, and health practices were rated highly, whereas the exercise domain was considered to be at a fair level. Additionally, the mean scores for participants' health literacy and access to COVID-19 preventive materials were 37.28 ± 6.37 and 4.14 ± 1.18, respectively, signifying good levels in both health

literacy and access to preventive materials. Furthermore, these participants exhibited greater social engagement, as indicated by their social network scores (mean = 15.08, SD = 5.59).

Table 3. Levels of Perceived Self-efficacy, Health Literacy, Access to COVID-19 Preventive Material, and Social Networks

Variables	Mean ± SD	Interpretation
Perceived self-efficacy (PSE)	76.48 ± 17.55	High
Nutrition self-efficacy	20.38 ± 4.61	High
Stress management self-efficacy	19.02 ± 4.39	High
Exercise self-efficacy	16.83 ± 5.99	Fair
Health practice self-efficacy	20.23 ± 4.61	High
Health literacy	37.28 ± 6.37	Good
Access to COVID-19 preventive materials	4.14 ± 1.18	Good
Social networks	15.08 ± 5.59	More social engagement

4.4. Health-Promoting Behaviors Level

Table 4 reveals that the mean and standard deviation (SD) for health-promoting behaviors (HPBs) were at a good level (mean = 67.44, SD = 7.51). Upon examining each subscale, the domains of smoking, alcohol consumption, rational drug use, and preventive behaviors for COVID-19 infection were rated at very good levels. Meanwhile, the nutrition domain was considered good (mean = 18.59, SD = 2.89), and the exercise domain was assessed as fair (mean = 6.09, SD = 1.98).

Table 4. Health-Promoting Behaviors

Variables	Health-Promoting Behaviors Levels; No. %				Mean± SD	Interpretation
	Very good	Good	Fair	Bad		
Health-promoting behaviors	114 (45.6)	94 (37.6)	8 (3.2)	2 (0.8)	67.44 ± 7.51	Good
Nutrition	64 (25.6)	93 (37.2)	72 (28.8)	28 (11.2)	18.59 ± 2.89	Good
Exercise	28 (11.2)	36 (14.4)	39 (15.6)	147 (58.8)	6.09 ± 1.98	Fair
Smoking	189 (75.6)	22 (8.8)	7 (2.8)	32 (12.8)	8.94 ± 1.87	Very good
Alcohol drinking	200 (80.0)	16 (6.4)	0 (0.0)	34 (13.6)	4.57 ± 0.94	Very good
Stress management	41 (16.4)	96 (38.4)	61 (24.4)	52 (20.8)	5.50 ± 1.19	Fair
Rational drug use	145 (58.0)	29 (11.6	61 (24.4)	52 (20.8)	9.78 ± 2.04	Very good
Preventive COVID-19 infection	213 (85.2)	18 (7.2)	17 (6.8)	2 (0.8)	13.93 ± 1.64	Very good

4.5. Factors Influencing Health-Promoting Behaviors

In our study, the prediction of health-promoting behaviors (HPBs) was analyzed using hierarchical regression analysis. As illustrated in Table 5, several factors were significant predictors of HPBs among older adults with NCDs: Perceived self-efficacy (β = 0.343, $p < 0.001$), perceived smoking (β = 0.226, $P < 0.001$), age (β = 0.204, $P < 0.001$), health literacy (β = 0.199, P = 0.016), and access to COVID-19 preventive materials (β = 0.123, P = 0.026). These variables collectively accounted for approximately 46.7% of the variance in HPBs.

Table 5. Hierarchical Regression Analysis of Factors Predicting Health-Promoting Behaviors

Models	B	SE	β	*t*	P-Value
Model 1					
(constant)	2.055	0.281		7.305	< 0.0001
Sex (female vs. male [a])	0.007	0.054	0.009	0.139	0.890
Age	0.081	0.038	0.143	2.149	0.033
Body mass index	0.042	0.023	0.108	1.796	0.074
Monthly income	0.040	0.035	0.083	1.142	0.254
Marital status (partner vs. non-partner a) [b]	-0.065	0.036	-0.113	-1.795	0.074
Education level (high school or higher vs. primary school or lower [a])	0.088	0.040	0.169	2.189	0.030
Current occupation (employed vs. unemployed [a])	0.021	0.014	0.100	1.534	0.126
Health care coverage (UHC vs. others [a, c])	-0.031	0.038	-0.060	-0.830	0.408
Comorbidity (yes vs. no [a])	-0.017	0.056	-0.019	-0.301	0.763
Perceived smoking (non-smoking vs. smoking [a])	0.189	0.052	0.242	3.594	<0.001
Perceived alcohol (non-drinking vs. drinking [a])	0.001	0.036	0.003	0.035	0.972
Perceived physical health status (fair/good vs. bad [a])	0.029	0.039	0.065	0.740	0.460
Perceived mental health status (fair/good vs. bad [a])	0.027	0.041	0.061	0.664	0.507
Perceived sleep quality (same/more than before vs. less than before [a])	-0.043	0.089	-0.033	-0.489	0.625
Perceived exercise (same/more than before vs. less than before [a])	0.155	0.068	0.150	2.269	0.024
$R = 0.461$, $R^2 = 0.212$, Adjusted $R^2 = 0.162$, R^2 change 0.212, $F = 4.200$, P-value < 0.001					
Model 2					
Constant	1.297	0.250		5.180	< 0.001
Sex (female vs. male [a])	0.019	0.045	0.023	0.415	0.678
Age	0.116	0.032	0.204	3.587	< 0.001
Body mass index	0.024	0.020	0.061	1.202	0.230
Monthly income	0.039	0.030	0.081	1.316	0.189
Marital status (partner vs. non-partner [a]) [b]	-0.032	0.031	-0.056	-1.041	0.299
Education level (high school or higher vs. primary school or lower [a])	0.041	0.034	0.078	1.204	0.230

Current occupation (employed vs. unemployed [a])	-0.001	0.012	-0.007	-0.127	0.899
Health care coverage (UHC vs. others [c])	-0.056	0.031	-0.109	-1.800	0.073
Comorbidity (yes vs. no [a])	-0.023	0.047	-0.025	-0.483	0.629
Perceived smoking (non-smoking vs. smoking [a])	0.176	0.044	0.226	4.012	< 0.001
Perceived alcohol (non-drinking vs. drinking [a])	-0.019	0.030	-0.038	-0.636	0.525
Perceived physical health status (fair/good vs. bad [a])	0.005	0.032	0.012	0.164	0.870
Perceived mental health status (fair/good vs. bad [a])	-0.002	0.034	-0.004	-0.056	0.955
Perceived sleep quality (same/more than before vs. less than before [a])	0.016	0.075	0.012	0.207	0.836
Perceived exercise (same/more than before vs. less than before [a])	0.041	0.059	0.039	0.686	0.494
Perceived self-efficacy	0.216	0.052	0.343	4.156	< 0.001
Health literacy	0.123	0.051	0.199	2.429	0.016
Access to COVID-19 preventive materials	0.206	0.092	0.123	2.236	0.026
Social networks	0.013	0.025	0.030	0.512	0.609
$R = 0.683$, $R^2 = 0.467$, Adjusted $R^2 = 0.423$, R^2 change 0.255, $F = 27.515$, P-value <0.001					

Abbreviation: UHC, universal health coverage.

[a] Reference group.

[b] Partner included married; non-partner included never married/single/widowed/divorced/ separated.

[c] Other included social security scheme/ civil servant medical benefit scheme/ private health insurance.

5. Discussion

The current study presents several key findings regarding HPBs among older adults with NCDs living in communities during the "new normal" post-COVID-19 era in Thailand. We discovered that community-dwelling older adults with NCDs exhibited a good level of HPBs. Similarly, a previous study showed that older adults with hypertension in both urban and rural communities in Thailand before the COVID-19 pandemic demonstrated a good level of HPBs (25). Our research also indicated that the exercise domain within HPBs was rated at a fair level. A cross-sectional study conducted during the COVID-19 pandemic in Saudi Arabia found that among adults, exercise was the least practiced HPB dimension (20). This is in line with a study in Germany, which found that the exercise domain of HPBs among older adults (aged 65 years or older) was lower compared to younger adults (aged 18- to 29-years-old) (30). This trend can be attributed to the fact that during the COVID-19 pandemic, older adults likely engaged in less physical activity as a precaution to maintain social distancing and prevent the spread of the virus (19, 31).

This study identified self-efficacy as the most significant positive predictor of health-promoting behaviors (HPBs) among older adults with NCDs. According to Pender's Health Promotion Model, perceived self-efficacy enhances individual confidence, with higher levels of perceived self-efficacy being linked to improved HPBs (32). Our results show that older adults with NCDs possess a high level of perceived self-efficacy, which is beneficial for their engagement in HPBs. This aligns with findings from previous studies that have found a positive association between perceived self-efficacy and HPBs among older adults in Thailand (16, 25), Indonesia (33), the Philippines (34), and South Korea (35). Perceived self-efficacy is crucial for older adults with NCDs as it impacts their decision to participate in HPBs to sustain their health (35). Therefore, recognizing the importance of perceived self-efficacy in this demographic is vital for healthcare workers, such as community nurses, who can support them both in the community and at home with preventive care (36).

Access to COVID-19 preventive materials also influences HPBs among older adults with NCDs. In our study, the majority of older adults with NCDs reported good access to COVID-19 preventive materials. Since the onset of the COVID-19 crisis in December 2019, the Thai government and healthcare agencies have been providing preventive materials to all residents to curb the spread of COVID-19. Older adults with better access to these materials are likely to exhibit more effective COVID-19 preventive behaviors. This observation is supported by a previous study, which found that older adults in Thai urban communities with good access to preventive materials demonstrated superior COVID-19 preventive behaviors compared to those with limited access (19). The COVID-19 pandemic has had diverse impacts on individuals' health and social well-being, especially among older adults. However, access to reliable preventive information through the Internet and media is crucial for minimizing COVID-19 exposure and transmission (37). Therefore, ensuring equitable access to COVID-19 preventive resources (e.g., face masks, handwashing facilities) and measures (e.g., vaccination, accurate information) is essential to diminish racial and ethnic disparities in COVID-19 outcomes (38).

Perceived smoking emerges as another predictor of health-promoting behaviors (HPBs) among older adults with NCDs. This could be attributed to the fact that a

vast majority of older adults did not smoke (88.4%), with only 2.4% of participants reporting increased smoking behaviors during the COVID-19 pandemic. Previous research supports our observation that non-smoking status is conducive to healthy behaviors, whereas smoking may significantly increase the risk of cardiovascular diseases, leading to unhealthy behaviors and complications from other conditions (39, 40). Individuals who are currently smoking or have escalated their smoking habits may face a heightened risk of coronavirus infection and more severe clinical outcomes (41). Another study found that older age correlated with a lower perceived risk of COVID-19 infection, and current smoking was linked to unhealthy behaviors such as a higher perceived risk of COVID-19 infection, perceived economic burdens, physical inactivity, and unhealthy dietary habits (42).

Health literacy also serves as a predictor of HPBs in older adults with NCDs. It stands as a crucial health indicator during the COVID-19 pandemic, enhancing individuals' health and well-being throughout their lives (43). Our findings suggest that older adults with NCDs exhibit a high level of health literacy, potentially leading to better HPBs. This aligns with previous research indicating that health literacy is associated with HPBs and health-related quality of life among older adults in Korea (35). Lower health literacy in older adults is linked to adverse health outcomes, including unhealthy behaviors (44), poor healthcare utilization (19), and suboptimal medication adherence (45). Therefore, health literacy is essential for fostering HPBs, especially among older adults. Furthermore, health literacy encompasses the capacity to comprehend, access, and apply health information according to one's attitudes and motivations for suitable HPBs and self-care (46, 47).

However, our study found that variables such as sex, body mass index, monthly income, marital status, education level, current occupation, healthcare coverage, comorbidity, perceived alcohol consumption, perceived physical health status, perceived mental health status, perceived sleep quality, perceived exercise, and social networks did not significantly improve HPBs among the population of older adults with NCDs studied. This contrasts with existing literature highlighting the impact of socioeconomic status indicators, especially education level, on health outcomes like morbidity and mortality (48). Prior research suggests that individuals with higher education levels tend to adopt better self-care practices, take proactive steps against risk factors (49), and actively seek health-related information for effective chronic illness management, ultimately reducing mortality risk (50). This discrepancy points to the complex and multifaceted nature of the relationship between various socio-demographic factors and health behaviors in older adults with NCDs, necessitating further investigation and consideration in future studies.

5.1. Limitations of the Study

Despite the significance of these findings for enhancing our understanding of the determinants of health-promoting behaviors (HPBs) among community-dwelling older adults with NCDs during the "new normal" of the post-COVID-19 era, our study is not without its limitations. Firstly, the research utilized a cross-sectional design to explore factors influencing HPBs among older adults with NCDs, which does not allow for establishing causal relationships between HPBs and the variables predicted to influence them. Future research should employ causal-comparative research or mixed-method designs to more thoroughly understand the cause-effect relationships among these variables and to delve into older adults' perceptions of HPBs in long-term care, especially in the context of the "new normal" era. Secondly, our sample consisted of 250 participants from a single province in Thailand, limiting the generalizability of our findings to older adults with NCDs in other provinces or countries. Future studies should aim for a larger, randomly sampled population across multiple regions. Thirdly, cognitive screening measures were used to assess participants' orientation to place, person, and time. Future research should incorporate validated and standardized structured cognitive assessment tools, such as the Mini-Mental State Examination (MMSE), the Montreal Cognitive Assessment (MoCA), and the cognitive subscale of the Alzheimer's Disease Assessment Scale (ADAS-cog), for a more comprehensive evaluation of cognitive impairment among older adults. Finally, while this study examined the association between socioeconomic data, perceived self-efficacy, health literacy, access to COVID-19 preventive material, social network, and HPBs, future research should explore socioeconomic differences (e.g., gender, education, socio-cultural and occupational differences) or include other factors (e.g., quality of life, environmental factors) to assess their long-term impact during the "new normal" of the post-COVID-19 era.

5.2. Conclusions

Our findings indicate that health-promoting behaviors (HPBs) among older adults with NCDs are generally at a good level, except for the exercise domain, which scored at a fair level. Significant predictors of HPBs in this population include perceived smoking, access to COVID-19 preventive materials, health literacy, age, and perceived self-efficacy. Our research underscores the importance of higher access to COVID-19 preventive materials, good health literacy, and elevated perceived self-efficacy in enhancing HPBs. It is crucial for multidisciplinary healthcare teams to take these factors into account when developing intervention strategies, with the goal of comprehensively understanding and improving health outcomes for older adults with NCDs. There is a pressing need for future studies to investigate the cause-effect relationships among these variables and to delve deeper into older adults' perceptions of HPBs, especially in the setting of long-term care during the 'new normal' era.

Footnotes

Authors' Contribution: Conceptualization, W.S., S.T., and J.S.; methodology, W.S., and S.T.; software, W.S. and J.S.; validation, W.S., S.T., and J.S.; formal analysis, W.S.; investigation, W.S., and S.T.; writing—original draft preparation, W.S.; writing—review and editing, S.T., and J.S; supervision, S.T., and J.S. All authors have read and agreed to the published version of the manuscript.

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Ethical Approval: The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Krirk University (protocol code 0204/001 and dated 1 July 2022) and the Institutional Review Board of Ubon Ratchathani Provincial Health Office (protocol code SSJ.UB 2565-115 and dated 9 September 2022).

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