Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia
Open Access Macedonian Journal of Medical Sciences. 2022 Apr 08; 10(E):725-732.
https://doi.org/10.3889/oamjms.2022.9385
eISSN: 1857-9655
Category: *E - Public Health*
Section: *Public Health Disease Control*

Factors Associated with a Health-promoting Lifestyle among Adults and Older Adults in the Era of COVID-19: An Integrative Review

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Edited by: Sasho Stoleski
Citation: Suksatan W, Teravecharoenchai S, Sarayuthpitak J. Factors Associated with a Health-Promoting Lifestyle among Adults and Older Adults in the Era of COVID-19: An Integrative Review. Open Access Maced J Med Sci. 2022 Apr 08; 10(E):725-732. https://doi.org/10.3889/oamjms.2022.9385
Keywords: Older adults; Health-promoting lifestyle; Sociodemographic data; Social factors; COVID-19
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Received: 15-Feb-2022
Revised: 15-Mar-2022
Accepted: 29-Mar-2022

Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist

Abstract

AIM: The aim of the study was to identify the factors associated with a health-promoting lifestyle (HPL) among adults or older adults during the COVID-19 pandemic.

METHODS: On the basis of the PRISMA guidelines, primary articles published in English within the period from December 2019 to December 2021 were searched for on five databases: PubMed, Cochrane Library, Scopus, Web of Science, and CINAHL Plus with Full Text. We also followed Whittemore and Knafl's framework to identify HPL among adults and older adults.

RESULTS: The current review identified nine relevant studies with a total of 4,509 adults and older adults. We found that sociodemographic was associated with HPL among both adults and older adults in the COVID-19 era. The findings also asserted that a nurse-led lifestyle intervention is an effective program for improving the self-efficacy and HPL of older adults with chronic illnesses.

CONCLUSION: According to this review's findings, individuals and health-care professionals should consider the sociodemographic and social factors associated with HPL among adults and older adults, it is important to improve and standardize the guidelines for home-based services so that they can be used properly to help them deal with the COVID-19 pandemic and similar health crises.

Introduction

The world is currently facing a terrible health crisis due to the COVID-19 (coronavirus disease 2019) pandemic. The disease is also intensifying as the virus causing it has been mutating (e.g., Omicron), causing higher morbidity and disease severity than previous disease outbreaks (e.g., SARS [severe acute respiratory syndrome], H1N1 flu [swine flu]) [1], [2]. According to the World Health Organization, as of January 4, 2022, there have been 290,959,019 active COVID-19 cases worldwide and 5,446,753 deaths from such disease, and new cases are still being detected and new deaths are still occurring [3]. COVID-19 afflicts people from all age groups, but especially those at risk (e.g., older adults, people with chronic diseases, and immunocompromised people), who are more likely to be infected and often develop severe symptoms leading to death [4].

During this time, the COVID-19 pandemic is affecting the aging population around the world, a high-risk group whose number is on the rise. It is especially critical for older adults to maintain good health because of their increased risk of infection and their potential for developing serious complications (e.g., pneumonia and cytokine storm) [5]. Several researchers have discovered that moderate physical activity boosts the immune response to viral respiratory infections [6], [7] and that social engagement brings health benefits to people of all ages [8]. However, the COVID-19 pandemic has posed challenges for older adults. Lockdowns, travel restrictions, and social distancing have been imposed in several countries to limit or stop the spread of the disease. These measures may affect all people, but particularly older adults, by restricting their ability to secure healthy food and their other needs [9], [10]. Moreover, physical activity, social events, residential community activities, and club operations have been suspended, and municipal facilities have ceased their onsite operations as a result of the COVID-19 shelter-in-place mandates [8], [9], [11], which causes health behavior changes in older adults.

The health promotion model (HPM) indicates that people's adoption of health-promoting behaviors (HPBs) is influenced by their behavior-specific cognition and affect, which interact with their characteristics and experiences [12]. Health-promoting lifestyle (HPL) is a subdimensional pattern of appropriate behaviors

(e.g., eating healthy food, engaging in physical activity, sleeping well), along with avoiding eating unhealthy food, alcohol consumption, and smoking, which can improve one's health and well-being [13], [14]. Thus, HPL is recommended for older adults as a particularly effective strategy for improving their health behaviors and their sense of well-being, which can, in turn, improve their quality of life [15], [16]. Previous studies have found that HPL can mediate the associations between individuals' perceived self-efficacy [9], [17], [18], and individuals' mental health [19], [20], and older adults' health and well-being [8, 21]. In addition, various factors contribute to the HPBs of older adults, such as marital status, monthly income, education level, physical activity, physical health, and social support [18], [21], [22], [23].

The importance of HPL's effect on the health of older adults has become more apparent with the changes in the population pyramid and with the growth of older people's health burden, especially during the COVID-19 pandemic. To the best of our knowledge, there have been few studies about HPL among adults and older adults in the COVID-19 era. Therefore, the current review aimed to identify factors associated with HPL among adults or older adults. It is hoped that the identification of these factors will enable the development of appropriate strategies to improve older adults' health and well-being.

Methods

Study design

The current integrative review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [24], which consist of a 27-item checklist and the following four phases: (1) identification; (2) screening; (3) eligibility; and (4) inclusion of this process. To identify HPL among adults and older adults, we also followed Whittemore and Knafl's framework [25], which consists of the following five steps: (1) problem identification; (2) literature search; (3) data evaluation; (4) data analysis; and (5) presentation.

Search strategy

One reviewer (WS) conducted a systematic literature search to identify literature indexed from database inception to December 30, 2021, using search terms based on adults and older adults and outcomes of interest. We searched for relevant studies from five online databases: PubMed, Cochrane Library, Scopus, Web of Science, and CINAHL Plus with Full Text. The following English search terms were used: "adult" (MeSH) OR "elderly" (MeSH) OR "aged" (MeSH) OR "older adults" (TIAB) OR "elderly" (TIAB) AND "health-promoting behavior*" (MeSH) OR "health promotion" (MeSH) OR "Health-Promoting Lifestyle" (TIAB) OR "HPLP" (TIAB) AND "COVID-19" (MeSH) OR "SARS-CoV-2" (MeSH) OR "pandemic" (MeSH) OR "outbreak" (TIAB) OR "virus SARS-CoV-2" (TIAB) OR "coronavirus disease 2019" (TIAB). Related terms were incorporated into the search strategy to ensure that all relevant articles would be retrieved.

Eligibility criteria

Primary studies were included in the current review if they met the following criteria: (1) Study that primarily aims to examine HPL; (2) with adults or older adults (18 years old or more) as subjects; (3) published in a peer-reviewed journal in English; and (4) conducted within the period from December 2019 to December 2021. The exclusion criteria were (1) not a primary source material; and (2) an unpublished study, a conference proceeding, a published abstract, a review article (e.g., literature review, integrative review, and systematic review), a letter to the editor, a book chapter, or a published study that had not undergone a peer review process.

Data abstraction

The selected studies were published within the period from December 2019 to December 2021 and were reviewed by the two authors (W.S., S.T.) to ensure that they met the selection criteria. Disagreements were resolved be discussion with the third reviewer (J.S.). We extracted the following data from the included studies: authors' name, country of origin, study design, target population, sample size, theoretical framework, HPL measures, HPL components, and studies variables and their associations with HPL. We also placed the data we had extracted from each primary study into a matrix table for data synthesis, as shown in Tables 1-3.

Table 1: Characteristics of included studies

Characteristic	n (%)
Publication year	
2020	2 (22.22)
2021	7 (77.78)
Country of origin	
China	3 (33.33)
Thailand	2 (22.22)
South Korea	2 (22.22)
Jordan	1 (11.11)
Saudi Arabia	1 (11.11)
Study design	
Cross-sectional study	8 (88.89)
Randomized controlled trial	1 (11.11)
Target population	
With non-communicable diseases (e.g., hypertension, stroke)	3 (33.33)
General older adults	3 (33.33)
Mixed (healthy, unhealthy, with co-morbidity)	2 (22.22)
With metabolic syndrome	1 (11.11)
Sample size	
< 200	3 (33.33)
201–400	3 (33.33)
> 401	3 (33.33)
Theoretical framework	
Health promotion model	9 (100)

Results

Article characteristics

In general, the results of our review indicate that in the previous relevant studies, HPL was used to assess the factors with the strongest influences on older adults' behaviors. The total of 6,417 articles extracted (4861 from PubMed, 864 from Scopus, 438 from Cochrane Library, 132 from CINAHL Plus with Full Text, and 122 from Web of Science) were reduced to 4342 after the duplicates were removed. Of these, 219 studies remained after an initial screening of titles and abstracts. We also excluded 4216 full articles for other reasons (e.g., did not pass the abstract screening, had incorrect outcomes, literature reviews, did not focus on HPL among older adults, or published in a language other than English). Finally, nine articles that met all the study's article eligibility criteria were included in the review. The details of the search process are illustrated in the PRISMA diagram (Figure 1).

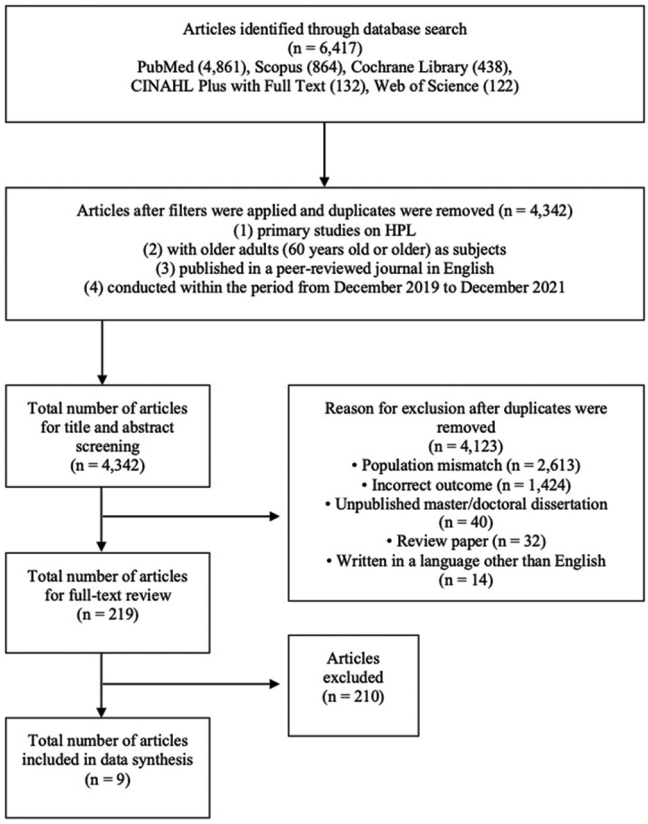

Figure 1: PRISMA flowchart for literature selection. Adopted from PRISMA guidelines [24]

The final sample consisted of eight cross-sectional studies [9], [18], [26], [27], [28], [29], [30], [31] and one randomized controlled trial (RCT) study [32] on the HPL of older adults during the COVID-19 pandemic. Three studies (33.33%) were conducted in China [29], [31], [32]; two in Thailand [9], [27]; two in South Korea [18], [28]; one in Jordan [30]; and one in Saudi Arabia [26] (Table 1). All the nine studies made use of a self-designed questionnaire, as shown in Table 3.

Participant characteristics

Most of those in the target populations in the included studies were older adults with non-communicable diseases (n = 3; 33.33%); general older adults (n = 3; 33.33%); mixed older-adult populations such as healthy and unhealthy older adults and older adults with comorbidities (n = 2; 22.22%); and older adults with metabolic syndrome (n = 1; 11.11%). In terms of number of participants, the nine included studies had a total of 4509 older-adult participants: 200 participants or lower (n = 3; 33.33%), 201–400 participants (n = 3; 33.33%), and above 401 participants (n = 3; 33.33%). All the studies used HPM as a conceptual framework (Table 1).

Health-promoting lifestyle measures

All the studies used the Health-Promoting Lifestyle Profile (HPLP) instrument to assess the HPL of their older-adult subjects during the COVID-19 pandemic, but with different numbers of items. Four primary studies used the 52-item HPLP [9], [18], [26], [28], two used the 47-item HPLP [27], [30], one used the 48-item HPLP [29], and one used the 25-item HPLP [32].

Components of health-promoting lifestyle

Most of the studies included in this review (n = 8) used HPLP instruments to assess HPL, focusing on the health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management components [9], [18], [26], [27], [28], [29], [30], [31]. One study considered only the health responsibility, spiritual growth, and interpersonal relations components [32].

Intervention for health-promoting behaviors

Only one study conducted an RCT to examine the effectiveness of a nurse-led lifestyle intervention program on the HPL of patients with metabolic syndrome in China [32]. The lifestyle intervention consisted of a face-to-face education session (30–40 min), an educational booklet, and six telephone follow-ups (biweekly, 20–30 min/call) in three months, which followed the HPM framework. The results of this RCT showed that lifestyle intervention could reduce cardiovascular risk. Zheng, Yu [32] also found that the self-efficacy score for the nutrition and stress components and the total HPL score revealed significant improvements at 1 month ($p < 0.05$). Lifestyle intervention also revealed significant improvements in all the subcomponents, in the total self-efficacy score, in all the dimensions, and in the total HPL score at 3 months ($p < 0.05$) [32].

Table 2: Summary of included studies

Author (s) (year of publication), country	Objective	Study design	Sample/mean age (year)/sex	Target population	HPLP measure (number of items)	HPLP components						
						Health responsibility	Physical activity	Nutrition	Spiritual growth	Interpersonal relations	Stress management	
Ashgar (2021), Saudi Arabia [26]	"To evaluate the health-promoting behaviors of Saudi adults in the Jazan region during the COVID-19 pandemic"	Cross-sectional study	305/32.13 ± 10.86/ female 72.8%	Saudi adults	HPLP-II (52-item)	✓	✓	✓	✓	✓	✓	
Chantakeeree *et al.* (2021), Thailand [27]	"To determine the predictability of individual characteristics and perceived self-efficacy on health-promoting behavior"	Cross-sectional study	420/70.18 ± 6.71/ female 81.90%	Older urban and rural Thai adults with hypertension	HPLP-II (47-item)	✓	✓	✓	✓	✓	✓	
Choi (2020), South Korea [18]	"To identify the associations of the eHealth use, eHealth literacy, informational support, and health-promoting behaviors of older adults as mediated by health self-efficacy"	Cross-sectional study	186/75.56 ± 5.98/ female 44.6%	Older South Korean adults	HPLP-II (52-item)	✓	✓	✓	✓	✓	✓	
Kim *et al.* (2021), South Korea [28]	"To identify the influence of type D personality on the health- promoting behaviors and QoL of patients with ischemic stroke in South Korea"	Cross-sectional study	170/64.9 ± 10.9/ female 31.2%	Older South Korean adults with stroke	HPLP-II (52-item)	✓	✓	✓	✓	✓	✓	
Li *et al.* (2021), China [29]	"To examine the association between eHealth literacy and HRQoL and to explore whether health-promoting behaviors mediate the association between eHealth literacy and HRQoL among older Chinese adults"	Cross-sectional study	2300/70.3 ± 6.4/ female 47.8%	Older Chinese adults	HPLP-II (48-item)	✓	✓	✓	✓	✓	✓	
Posai *et al.* (2021), Thailand [9]	"To determine the relationships among the patients characteristics, perceived self-efficacy, social support, and perceived benefits and barriers to HPBs among hospitalized patients with NCDs during the second wave of COVID-19"	Cross-sectional study	250/48.92 ± 8.90/ female 58.0%	Thai patients with NCDs	HPLP-II (52-item)	✓	✓	✓	✓	✓	✓	
Rababa *et al.* (2021), Jordan [30]	"To examine the HPBs and health needs of older adults in Jordan and the factors associated with these"	Cross-sectional study	220/66 ± 6.186/ female 33.60%	Older Jordanian adults	HPLP-II (47-item)	✓	✓	✓	✓	✓	✓	
Wu and Sheng (2021), China [31]	"To describe the characteristics and relationships of social isolation and health-promoting behaviors of older Chinese adults with different health statuses"	Cross-sectional study	485/70.31 ± 7.66/ female 64.9%	Older adults with different health conditions (healthy, with one disease, and with multiple morbidities)	HPLP-II (40-item)	✓	✓	✓	✓	✓	✓	
Zheng *et al.* (2020), China [32]	"To examine the effects of a nurse-led lifestyle intervention program on cardiovascular risks, self-efficacy and the implementation of health-promoting behaviors"	Two-armed randomized controlled trial	173/55.62 ± 10.65/ female 50.86%	Chinese adults (≥ 18 years) diagnosed with metabolic syndrome	HPLP-II (25-item)	×	✓	✓	×	×	✓	

HPBs: Health-promoting behaviors, HPLP-II: Health-promoting lifestyle profile II, NCDs: Non-communicable diseases, HRQoL: Health-related quality of life, COVID-19: Coronavirus disease 2019.

Factors associated with health-promoting lifestyle among adults and older adults during the COVID-19 pandemic

The results of this review indicate a strong relationship between certain sociodemographic factors and HPL among adults and older adults with chronic illnesses in the COVID-19 era. The sociodemographic factors were gender [26], [29], [31], age [9], [26], [29], education level [26], [29], [31], marital status [29], [30], monthly income [18], [28], [29], [31], current occupation [27], living arrangement [29], [31], smoking history [28], drinking history [27], and chronic disease [30]. We also found associations between HPL and the following social factors: social isolation [31], QoL [31], health-related quality of life (HRQoL) [29], antidepressant medication [28], self-efficacy [9], [18], [27], [32], activities of daily living (ADL) [29], eHealth literacy [18], [29], eHealth use [18], perceived health status [18], [27], information social support [9], [18], perceived benefits of HPBs [9], and perceived barriers to HPBs [9]. The current review also indicated that clinical variables (e.g., motor deficits and speech deficit) [28], number of people in the household [26], whether one had a job before the onset of the COVID-19 pandemic [26], whether one had a job after the onset of the COVID-19 pandemic [26], and affected income [26] are strongly associated with HPL among older adults in the COVID-19 era.

Discussion

HPM has been used to promote physical and mental well-being, particularly in older adults. The aim of this integrative review was to identify factors associated with HPL among adults and older adults in the COVID-19 era. Overall, nine primary studies met the article eligibility criteria, and the data obtained from them were synthesized in the review. We explored six components of HPL under HPM. HPM could help healthcare professionals understand the key determinants of health behaviors, which would enable them to provide behavioral counseling to their clients in terms of promoting healthier lifestyles [12]. Indeed, all the studies that were included in this review adopted HPM as a conceptual framework.

In this integrative review, we confirmed the associations of several factors with HPL among adults and older adults in the COVID-19 era. First, we found that multiple sociodemographic factors are associated with HPL. Of the nine primary studies that were included in this review, eight cross-sectional studies [9], [18], [26], [27], [28], [29], [30], [31] asserted that gender [26], [29], [31], age [9], [26], [29], education level [26], [29], [31], marital status [29], [30], monthly income [18], [28], [29], [31], current occupation [27],

AQ3 **Table 3: Studies' variables and their associations with health-promoting lifestyle**

Authors	Data source	Study variables		Factors associated with HPLP	
				Sociodemographic factors	Social factors
Ashgar [26]	Self-designed questionnaire	Age Gender Body mass index Education level Marital status Affected income Number of people in the household COVID-19 news hours per day	Whether one had a job before the onset of the COVID-19 pandemic Whether one had a job after the onset of the COVID-19 pandemic Whether the COVID-19 pandemic affected one's income Type of curfew imposed Presence of comorbidity	Gender (p < 0.05) Age (p < 0.01) Education level (p = 0.036)	Number of people in the household (p < 0.05) Whether one had a job before the onset of the COVID-19 pandemic (p < 0.01) Whether one had a job after the onset of the COVID-19 pandemic (p < 0.05) Whether the COVID-19 pandemic affected one's income (p < 0.01)
Chantakeeree *et al.* [27]	Self-designed questionnaire	Age Education level Employment Duration of hypertension Perceived health status Presence of comorbidity Perceived self-efficacy	Gender Living arrangement Monthly income Marital status Smoking history g history	Current occupation (p < 0.001) Drinking status (p < 0.05)	Perceived health status (p < 0.05) Perceived self-efficacy (p < 0.001)
Choi [18]	Self-designed questionnaire	Age Education level Employment Perceived economic status Presence of comorbidity Perceived health status Information social support Health self-efficacy	Gender Living arrangement Marital status Cognitive function eHealth use eHealth literacy	Perceived economic status (p = 0.026)	Perceived health status (p < 0.001) eHealth use (p < 0.01) eHealth literacy (p < 0.01) Informational social support (p < 0.01) Health self-efficacy (p < 0.01)
Kim *et al.* [28]	Self-designed questionnaire	Age Education level Employment Blood pressure Alcohol drinking history Antidepressant medication Speech deficits	Gender Marital status Family income Smoking history Motor deficits Sensory deficits	Family income (p = 0.049) Smoking history (p = 0.015)	QoL (p < 0.001) Antidepressant medication (p = 0.049) Motor deficits (p < 0.001) Spech deficits (p = 0.046)
Li *et al.* [29]	Self-designed questionnaire	Age Education level Marital status ADL HRQoL	Gender Living arrangement Family income eHealth literacy	Age (p = 0.022) Gender (p < 0.001) Living arrangements (p < 0.001) Education level (p < 0.001) Marital status (p < 0.001) Family income (p < 0.001)	ADL (p = 0.018) eHealth literacy (p = 0.028) HRQoL (p < 0.001)
Posai *et al.* [9]	Self-designed questionnaire	Age Body mass index Religion Presence of comorbidity Perceived benefit Perceived barriers Perc self-efficacy Perceived health status Information social support	Gender Education level Marital status Health insurance Cognitive function eHealth use eHealth literacy	Age (p < 0.05)	Perceived benefit (p < 0.01) Perceived barriers (p < 0.01) Perceived self-efficacy (p < 0.01) Social support (p < 0.01)
Rababa *et al.* [30]	Self-designed questionnaire	Gender Chronic disease Health insurance	Marital status Smoking status	Marital status (p < 0.001) Chronic disease (p < 0.001)	NS
Wu and Sheng [31]	Self-designed questionnaire	Age Education level Living arrangements	Gender Monthly income Social isolation	Gender (p < 0.05) Education level (p < 0.05) Monthly income (p < 0.05) Living arrangement (p < 0.05)	Social isolation (p < 0.05)
Zheng *et al.* [32]	Self-designed questionnaire	Age Education level Employment Self-efficacy Psychological well-being	Gender Marital status Smoking history Cardiovascular risk	NS	Self-efficacy (p = 0.014)

ADL: Activities of daily living, QoL: Quality of life, HRQoL: Health-related QoL, NS: Not significant, HPLP: Health-promoting lifestyle profile, COVID-19: Coronavirus disease 2019.

living arrangement [29], [31], smoking history [28], drinking history [27], and chronic disease [30] are associated with HPL. Interestingly, sociodemographic factors are important predictors of the adoption of protective behaviors during the COVID-19 pandemic, particularly in older adults. According to the studies, older female adults are more likely than male adults to experience anxiety [33], and women's anxiety levels are 3 times higher than men's during the COVID-19 pandemic [34]. As seen in the previous studies, sociodemographic factors could explain 52% of the anxiety cases, 50.5% of the psychological well-being, and 46.9% of the depression cases among older adults during the COVID-19 pandemic [35], [36], [37]. It is important to understand what motivates people to carry out health behaviors or not to during a pandemic, given the role that human behavior plays in disease transmission.

Likewise, a previous study confirmed that higher education, high income (above US$80,000/year), and increasing age are protective against food insecurity, and that people living in rural areas expect that they will face a greater burden of food insecurity than those living in urban areas during the COVID-19 pandemic [38], which is related to health behaviors. Moreover, early evidence indicates widespread moderate-to-severe stress and economic insecurity during the pandemic [39], [40], and experts warn of the possibility of crisis-related increases in smoking and in the consumption of alcohol and other potentially addictive substances [41], [42]. We also found that

gender [26], [29], [31], age [9], [26], [29], education level [26], [29], [31], monthly income [18], [28], [29], [31], current occupation [27], and living arrangement [29], [31] are associated with HPL. Our findings show that sociodemographic factors may have an impact on older adults' positive health behaviors (eating, sleeping, and engaging in physical activity) and negative health behaviors (alcohol consumption, smoking, and drug use).

Our review also revealed that multiple social factors are associated with HPL. Of the nine primary studies that were included in our review, eight confirmed that social isolation [31], QoL [31], HRQoL [29], self-efficacy [9], [18], [27], [32], ADL [29], eHealth literacy [18], [29], eHealth use [18], perceived health status [18], [27], information social support [9], [18], perceived benefits of HPBs [9], and perceived barriers to HPBs [9] are associated with HPL among older adults during the COVID-19 pandemic. During this crisis, good COVID-19-preventive behaviors are essential for all age groups, but particularly for older adults. Older adults' access to health information, high health literacy, high self-efficacy, and support from family, neighbors, and health-care professionals could affect their daily living activities and could improve their HPBs [11], [43], [44]. Maintaining and promoting HRQoL is a key component of HPB that includes self-actualization and health responsibility, exercise, nutrition, interpersonal support, and stress management [9], [29]. In addition, older adults' perceptions of stress, self-efficacy, and health outcomes can be mediated by healthy behaviors [10], [45], [46].

We found only one RCT study that was conducted in patients with metabolic syndrome. The nurse-led lifestyle intervention program in such study included face-to-face education, an educational booklet, and telephone follow-ups; it was an effective intervention for improving self-efficacy and HPL in older adults with metabolic syndrome [32]. However, it is important to increase older adults' awareness of their individual responsibility to take care of themselves and also of their social responsibility to "flatten the curve" and slow down the spread of the virus. Some countries have launched COVID-19 infection prevention campaigns for everyone living in the country. For example, the Thai government communicates daily with everyone living in Thailand via social media (e.g., Thai television channels and Thai radio) to obtain their cooperation in stopping the spread of the virus and to deliver a report on the COVID-19 situation in Thailand. To avoid acquiring COVID-19, the Thai government has advised the public to take the "DMHTT (distancing, mask wearing, hand washing, temperature checking, and Thai Chana application) precautions" seriously, advising everyone to avoid public gatherings and to stay home unless it is absolutely necessary for one to leave [10]. These policies have had a significant impact on the lives of older adults, particularly on their health habits, lifestyle pattern, social participation, physical activity, and economic slowdown.

Implications for future research and practice

The current review has several strengths. First, our findings confirm that sociodemographic factors are important predictors of HPBs among adults and older adults during the COVID-19 pandemic. Some sociodemographic factors may allow for a better understanding of HPL and may help the government detect, anticipate, and minimize the pandemic's impact on the psychological well-being of older adults. Second, we found that social factors are essentially associated with the health behaviors of older adults (e.g., health literacy, self-efficacy, social support, and QoL). Third, a nurse-led lifestyle intervention program for nursing practice should embed the core component of HPM in HPL to improve the self-efficacy of and HPL implementation in older adults with metabolic syndrome and to promote healthy and continuing care among them.

Limitations

The current integrative review had several limitations. First, we did not include primary studies from the gray literature; future studies should therefore include unpublished papers, conference proceedings, and other reviews to reduce the publication bias. Second, only English language articles were included in this study; future studies should thus consider including articles written in languages other than English that report studies on the effect of the COVID-19 pandemic on older adults. Third, we searched for relevant articles from only five online databases and found only articles on studies conducted in Asian countries; the data obtained from these articles could not be applied to other continents and settings. Future studies should thus include more databases to increase the number of published studies obtained and included in the review, particularly studies with a variety of continent settings. Finally, we found only one RCT study; more intervention studies are needed to evaluate the effectiveness of the HPL program in improving the physical and psychological well-being of adults or older adults with chronic illnesses and to encourage transition care between older adults' own homes and other health-care settings (e.g., hospital and nursing home).

Conclusion

HPL is important for adults and older adults especially during the COVID-19 pandemic. Our

findings show that some sociodemographic factors and social factors are associated with HPL in adults or older adults. Nurse-led lifestyle intervention was also found to be an effective program for improving the self-efficacy and HPL of older adults. Therefore, individuals and healthcare professionals should consider the sociodemographic and social factors associated with HPL in adults and older adults. In addition, it is critical to improve and standardize home-based service guidelines to ensure that they can be used effectively to assist individuals and communities in dealing with the COVID-19 pandemic and similar health crises.

References

1. Mant M, Holland A, Prine A. Canadian university students' perceptions of COVID-19 severity, susceptibility, and health behaviours during the early pandemic period. Public Health Pract. 2021;2:100114. https://doi.org/10.1016/j.puhip.2021.100114
   PMid:33875980
2. Choompunuch B, Suksatan W, Sonsroem J, Kutawan S, In-Udom A. Stress, adversity quotient, and health behaviors of undergraduate students in a Thai university during COVID-19 outbreak. Belitung Nurs J. 2021;7(1):1276. https://doi.org/10.33546/bnj.1276
3. World Health Organization. WHO Coronavirus (COVID-19) Dashboard 2021. Available from: https://www.covid19.who.int. [Last accessed on 2022 Jan 04].
4. Widjaja G, Jalil AT, Rahman HS, Abdelbasset WK, Bokov DO, Suksatan W, *et al*. Humoral immune mechanisms involved in protective and pathological immunity during COVID-19. Hum Immunol. 2021;82(10):733-45. https://doi.org/10.1016/j.humimm.2021.06.011
   PMid:34229864
5. Centers for Disease Control and Prevention. Coronavirus Disease 2019: People Who are at Higher Risk for Severe Illness; 2020. Available from: https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html. [Last accessed on 2022 Jan 04].
6. Nieman DC. Moderate exercise improves immunity and decreases illness rates. Am J Lifestyle Med. 2011;5(4):338-45. https://doi.org/10.1177/1559827610392876
7. Nieman DC, Wentz LM. The compelling link between physical activity and the body's defense system. J Sport Health Sci. 2019;8(3):201-17. https://doi.org/10.1016/j.jshs.2018.09.009
   PMid:31193280
8. Son JS, Nimrod G, West ST, Janke MC, Liechty T, Naar JJ. Promoting older adults' physical activity and social well-being during COVID-19. Leisure Sci. 2021;43(1-2):287-94. https://doi.org/10.1080/01490400.2020.1774015
9. Posai V, Suksatan W, Choompunuch B, Koontalay A, Ounprasertsuk J, Sadang JM. Assessment of the health-promoting behaviors of hospitalized patients with non-communicable diseases during the second wave of COVID-19. J Multidiscip Healthc. 2021;14:2185-94. https://doi.org/10.2147/jmdh.s329344
   PMid:34413651
10. Yodmai K, Pechrapa K, Kittipichai W, Charupoonpol P, Suksatan W. Factors associated with good COVID-19 preventive behaviors among older adults in urban communities in Thailand. J Prim Care Commun Health. 2021a;12:1-9. https://doi.org/10.1177/21501327211036251
    PMid: 34334008
11. Pechrapa K, Yodmai K, Kittipichai W, Charupoonpol P, Suksatan W. Health literacy among older adults during COVID-19 pandemic: A cross-sectional study in an urban community in Thailand. Ann Geriatr Med Res. 2021;25(4):309-17. https://doi.org/10.4235/agmr.21.0090
    PMid:34735760
12. Pender NJ, Murdaugh CL, Parsons MA. Health Promotion in Nursing Practice. 7th ed. New York: Person Education; 2015.
13. Cureau FV, Sparrenberger K, Bloch KV, Ekelund U, Schaan BD. Associations of multiple unhealthy lifestyle behaviors with overweight/obesity and abdominal obesity among Brazilian adolescents: A country-wide survey. Nutr Metab Cardiovasc Dis. 2018;28(7):765-74. https://doi.org/10.1016/j.numecd.2018.04.012
    PMid:29843935
14. Lin KM, Chiou JY, Kuo HW, Tan JY, Ko SH, Lee MC. Associations between unhealthy lifestyle behaviors and metabolic syndrome by gender in young adults. Biol Res Nurs. 2018;21(2):173-81. https://doi.org/10.1177/1099800418816175
    PMid:30522333
15. Şenol V, Ünalan D, Soyuer F, Argün M. The relationship between health promoting behaviors and quality of life in nursing home residents in Kayseri. J Geriatr. 2014;2014:839685. https://doi.org/10.1155/2014/839685
16. Cao W, Hou G, Guo C, Guo Y, Zheng J. Health-promoting behaviors and quality of life in older adults with hypertension as compared to a community control group. J Hum Hypertension. 2018;32(8):540-7. https://doi.org/10.1038/s41371-018-0073-y
    PMid:29789690
17. Sheeran P, Maki A, Montanaro E, Avishai-Yitshak A, Bryan A, Klein WM, *et al*. The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. Health Psychol. 2016;35(11):1178-88. https://doi.org/10.1037/hea0000387
    PMid:27280365
18. Choi M. Association of ehealth use, literacy, informational social support, and health-promoting behaviors: Mediation of health self-efficacy. Int J Environ Res Public Health. 2020;17(21):7890. https://doi.org/10.3390/ijerph17217890
    PMid:33126469
19. Peyman N, Olyani S. Iranian older adult's mental wellbeing during the COVID-19 epidemic. Asian J Psychiatr. 2020;54:102331. https://doi.org/10.1016/j.ajp.2020.102331
    PMid:32777754
20. Kontoangelos K, Economou M, Papageorgiou C. Mental health effects of COVID-19 pandemia: A review of clinical and psychological traits. Psychiatry Investig. 2020;17(6):491-505. https://doi.org/10.30773/pi.2020.0161
    PMid:32570296
21. Khami L, Motalebi S, Mohammadi F, Momeni M, Shahrokhi A. Can social support predict health-promoting behaviors among community-dwelling older adults? Soc Health Behav. 2020;3(1):22-6. https://doi.org/10.4103/shb.shb_50_19
22. Suksatan W, Ounprasertsuk J. Health-promoting behaviors and related factors in patients with chronic diseases in a rural community. Syst Rev Pharm. 2020;11(10):624-7. https://doi.org/10.31838/srp.2020.10.93
23. Ahmadi Z, Amini L, Haghani H. Determining a health-promoting lifestyle among afghan immigrants women in Iran. J Prim Care Community Health. 2020;11:1-8. https://doi.org/10.1177/2150132720954681
    PMid:32951511

24. Page MJ, Moher D, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, *et al*. PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. BMJ. 2021;372:n160. https://doi.org/10.1136/bmj.n160
PMid:33781993
25. Whittemore R, Knafl K. The integrative review: Updated methodology. J Adv Nurs. 2005;52(5):546-53. https://doi.org/10.1111/j.1365-2648.2005.03621.x
PMid:16268861
26. Ashgar RI. Health-promoting behaviour during the COVID-19 pandemic among Saudi Adults: A cross-sectional study. J Adv Nurs. 2021;77(8):3389-97. https://doi.org/10.1111/jan.14863
PMid:33896054
27. Chantakeeree C, Sormunen M, Jullamate P, Turunen H. Health-promoting behaviors among urban and rural older Thai adults with hypertension: A cross-sectional study. Pac Rim Int J Nurs Res. 2021;25(2):242-54. https://doi.org/10.1177/00914150211050880
28. Kim SR, Kim S, Cho BH, Yu S, Cho KH. Influence of type D personality on health promoting behaviours and quality of life in stroke patients: A cross-sectional study in South Korea. J Stroke Cerebrovasc Dis. 2021;30(5):105721. https://doi.org/10.1016/j.jstrokecerebrovasdis.2021.105721
PMid:33735669
29. Li S, Cui G, Yin Y, Wang S, Liu X, Chen L. Health-promoting behaviors mediate the relationship between eHealth literacy and health-related quality of life among Chinese older adults: A cross-sectional study. Qual Life Res. 2021;30(8):2235-43. https://doi.org/10.1007/s11136-021-02797-2
PMid:33661455
30. Rababa M, Al Ali N, Alshaman A. Health promoting behaviors, health needs and associated factors among older adults in Jordan: A cross-sectional study. Int J Community Based Nurs Midwifery. 2021;9(2):106-16. https://doi.org/10.30476/ijcbnm.2020.87493.1443
PMid:33875963
31. Wu F, Sheng Y. Social isolation and health-promoting behaviors among older adults living with different health statuses: A cross-sectional study. Int J Nurs Sci. 2021;8(3):304-9. https://doi.org/10.1016/j.ijnss.2021.05.007
PMid:34307779
32. Zheng X, Yu H, Qiu X, Chair SY, Wong EM, Wang Q. The effects of a nurse-led lifestyle intervention program on cardiovascular risk, self-efficacy and health promoting behaviours among patients with metabolic syndrome: Randomized controlled trial. Int J Nurs Stud. 2020;109:103638. https://doi.org/10.1016/j.ijnurstu.2020.103638
33. Wong SY, Zhang D, Sit RW, Yip BH, Chung RY, Wong CK, *et al*. Impact of COVID-19 on loneliness, mental health, and health service utilisation: A prospective cohort study of older adults with multimorbidity in primary care. Br J Gen Pract. 2020;70(700):e817. https://doi.org/10.3399/bjgp20x713021
PMid:32988955
34. Caycho-Rodríguez T. Evaluación de la coronafobia en población adulta mayor durante de la pandemia del nuevo coronavirus-19. Rev Esp Geriatría Gerontol. 2021;56(4):247-8. https://doi.org/10.1016/j.regg.2021.02.006
PMid:33888308
35. Caycho-Rodríguez T, Tomás JM, Vilca LW, García CH, Rojas-Jara C, White M, *et al*. Predictors of mental health during the COVID-19 pandemic in older adults: the role of socio-demographic variables and COVID-19 anxiety. Psychol Health Med. 2022;27(2):453-65. https://doi.org/10.1080/13548506.2021.1944655
PMid:34157907
36. Ahmed O, Faisal RA, Sharker T, Lee SA, Jobe MC. Adaptation of the Bangla version of the COVID-19 anxiety scale. Int J Mental Health Addict. 2022;20(1):284-95. https://doi.org/10.1007/s11469-020-00357-2
PMid:32837436
37. Milman E, Lee SA, Neimeyer RA. Social isolation and the mitigation of coronavirus anxiety: The mediating role of meaning. Death Stud. 2022;46(1):1-13. https://doi.org/10.1080/07481187.2020.1775362
PMid:32544375
38. Kent K, Murray S, Penrose B, Auckland S, Visentin D, Godrich S, *et al*. Prevalence and socio-demographic predictors of food insecurity in australia during the COVID-19 pandemic. Nutrients. 2020;12(9):2682. https://doi.org/10.3390/nu12092682
PMid:32887422
39. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, *et al*. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health. 2020;17(5):1729. https://doi.org/10.3390/ijerph17051729
PMid:32155789
40. Thakur V, Jain A. COVID 2019-suicides: A global psychological pandemic. Brain Behav Immun. 2020;88:952-3. https://doi.org/10.1016/j.bbi.2020.04.062
PMid:32335196
41. Volkow ND. Collision of the COVID-19 and addiction epidemics. Ann Intern Med. 2020;173(1):61-2. https://doi.org/10.7326/m20-1212
PMid:32240293
42. Clay JM, Parker MO. Alcohol use and misuse during the COVID-19 pandemic: A potential public health crisis? Lancet Public Health. 2020;5(5):e259. https://doi.org/10.1016/s2468-2667(20)30088-8
PMid:32277874
43. Suksatan W, Prabsangob K, Choompunuch B. Association between health literacy, self-care behavior, and blood sugar level among older patients with type 2 diabetes in rural Thai communities. Ann Geriatr Med Res. 2021;25(4):318-23. https://doi.org/10.4235/agmr.21.0117
PMid:34958731
44. Sadang JM, Palompon DR, Suksatan W. Older adults' experiences and adaptation strategies during the midst of COVID-19 crisis: A qualitative instrumental case study. Ann Geriatr Med Res. 2021;25(2):113-21. https://doi.org/10.4235/agmr.21.0051
PMid:34187141
45. Yodmai K, Somrongthong R, Nanthamongkolchai S, Suksatan W. Effects of the older family network program on improving quality of life among older adults in Thailand. J Multidiscip Healthc. 2021b;14:1373-83. https://doi.org/10.2147/jmdh.s315775
PMid:34135595
46. Wu F, Sheng Y. Social support network, social support, self-efficacy, health-promoting behavior and healthy aging among older adults: A pathway analysis. Arch Gerontol Geriatr. 2019;85:103934. https://doi.org/10.1016/j.archger.2019.103934