Model Development for Promoting Environmental Health Behaviors that Affect the Health of Older Adults in Chachoengsao Province

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ABSTRACT:
Introduction:The environmental health behavior studies focus on basic public health management needs, including waste and excreta management, water supply and drinking water management, insect and animal vector management, wastewater management, and chemical management. The study also examines problem situations and needs, creating good practice guidelines through the participatory processes of older adults.**Objectives**: Study the environmental healthbehaviors of older adults and develop a model for promoting environmental health behaviors that affect the health of older adults.**Methods**: Mixed methods consisting of quantitative methodology using questionnaires and qualitative methodology using small group discussions.**Results**: The results found that older adults have a high level of knowledge about environmental health for 46.70 percent, a high level of awareness of environmental health for 36.70 percent, and a moderate level of behavior regarding environmental health (practice often) for 50 percent. The correlation coefficient analysis between the variables found a relationship between knowledge about environmental health and level of awareness about environmental health, with a relationship to environmental health behavior of the sample group that was statistically significant at the 0.05 level. A model for promoting environmental health behavior that affects the health of older adults in Chachoengsao Province applies theconcept of active aging and concepts of health beliefs. The older adults were involved in decision-making, operations, utilization, and evaluation, proposing guidelines to promote environmental health behavior to raise awareness among older adults about the benefits of a healthy and hygienic environment in waste management, management of tap water and drinking water, wastewater management, insects and animal disease management, air quality management, chemical management and management of facilities for the older adults. **Conclusion:**This study creates a model for promoting environmental health behavior that affects health in a manner appropriate to the community context to enable older adults to have a good quality of life and a good environment, reduce inequality, and build strength in the community.

1. Introduction

Thailand is entering an aging societydue to declining newborn populations while the older population continues to increase. In 2022, Thailand had a population of 66.09 million, with 32.27 million males and 33.82 million females. The population aged 60 and over numbered 12.70 million, accounting for 19.22%. Of these older people, 5.88 million were male (8.90%),and 6.82 million were female (10.32%). When considering older adults by age group, the majority (57.4%) were in the early older stage [1]. According to population projections by the Office of the National Economic and Social Development Council (NESDC), by 2031, Thailand will have a population aged 60 and over, increasing to 28% of the total population, resulting in Thailand becoming a complete super-aged society [2]. The increase in the older population leads to other problems, as the older people experience physical decline, reducing their work capacity, lack of income, and necessitating dependence on others. Moreover, Thai society has reduced readiness to care for older adults in families. Without preparation for older people's care and protection, the increasing older population will soon become a significant problem for the country. A study on the impact of abandoned older people [3] found that older people face physical problems with deteriorating health conditions and chronic diseases such as musculoskeletal disorders, hypertension, and diabetes. Economically, older adults cannot adequately cover their daily living expenses, with 31% of older adults still working to support themselves. Most older adults living in rural areas work in agriculture, and this group tends to have less education and lack knowledge of how to prepare for old age [4]. Ruralolder people face social inequality issues in substandard basic public health management systems, such as wastewater management, water supply and drinking water, waste and excreta management, and insect and animal vector management, all of which can be sources of communicable diseases [5].Therefore, preparing to meet basic living needs to reduce health inequalities among older adults and models for promoting environmental health behaviors and proper public health management for older adults are essential. These contribute to health promotion, enabling older adults to have good health and happiness. The environmental health behaviors of older adults are related to health beliefs. According to the

Health Belief Model (HBM) by [6], human health beliefs motivate individuals to have good health by perceiving and changing behaviors to prevent and manage potential health problems. The Department of Older Adults'Health[7] has reported that the desired health behavior of older adults is that the health problems most older adults face are partly caused by physical deterioration. The health behavior of older adults themselves causes another part. Creating awareness in promoting holistic health and managing a hygienic environmental health system for older people will be a guideline to reduce the risk of disease, reduce dependency, and enable older adults to have the desired health behavior.From the ranking of environmental health indicators that are conducive to good health [8] was found that the environmental health indicators that are conducive to good health consist of 3 aspects: 1) Economic and social aspects in terms of population density, population growth, and dependency rate; 2) Environmental aspects in terms of water supply for consumption, food sanitation, housing environment management, waste management, and insect and disease control; and 3) Health aspects in terms of chronic disease rates, communicable diseases, non-communicable diseases, and accident incidence rates. Good environmental health behaviors will help older adults have a good quality of life and well-being. The approach to reducing health inequality among older adults is an urgent issue and is consistent with the development strategy of Chachoengsao Province. The approach to reducing health inequalities among older adults is an urgent issue. It aligns with the development strategy of Chachoengsao Province, which emphasizes good health and quality of life for older adults. Therefore, the researchers are interested in developing a model for promoting environmental health behaviors that affect the health of older adults in Chachoengsao Province. This research aims to study older people's environmental health behaviors and develop a model for promoting environmental health behaviors that affect the health of older adults. The environmental health behaviors of interest focus on basic public health management needs, including waste and excreta management, water supply and drinking water management, insect and animal vector management, wastewater management, and chemical management. The study also examines problem situations and needs, creating good practice guidelines through the participatory processes of older adults.

2. Methodology

This research uses mixed methods, including quantitative research and qualitative research,to develop a model of environmental health behavior that affects the health of the older group in Chachoengsao Province by dividing the research into 2 phases as follows:

Phase 1: research studies environmental health behaviors that affect the health of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province; this is a quantitative research by collecting data through questionnaires to measure knowledge, perception, and behavior in environmental health and the primary health care system in the area, which is descriptive research to explain the causal factors affecting environmental health that affect the health of older adults.

Phase 2: research development of a model for promoting environmental health behaviors that affect the health of older adults, which is qualitative research with the participation of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province through focus group discussions to develop an environmental health behavior model appropriate for older adults and policy recommendations to relevant local government agencies to apply the developed model in the area.

1) Population and sample:

1.1) The population consists of older adultsaged 60 years and above in the Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province, totaling 5,606 people [9].

1.2) The sample group In both phase 1 and phase 2 of the research, the researcher determined the criteria for selecting the sample group to participate in the project (inclusion criteria) by specific method (purposive sampling), that is, 30 older adults that are people aged 60 years, male or female, able to help themselves, have good communication skills in speaking, listening and writing, be an older adult with a social personality, have good health and be listed as a member leader of the Pak Nam Subdistrict seniorclub, Bang Khla District, Chachoengsao Province (total members 210 people), having resided in Chachoengsao Province for at least 1 year (June 2020 to June 2021) and voluntarily participating in the research project. Most of the sample group were leaders of the senior clubs who continuously organized activities to promote health and environmental behaviors in the Pak Nam Subdistrict every month. This resulted in them having skills, knowledge, awareness,

perception, and behaviors in environmental health and being ready to provide information for studying causal factors related to environmental health behaviors through questionnaires. They could also participate in focus groups to develop a model for promoting environmental health behaviors that affect the health of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province.

2) Research instrument: the questionnaire passed ethical review for human research from the Human Research Ethics Committee of Chachoengsao Provincial Public Health Office [COA No. PH_CCOREC 002/2022], is divided into 4 parts as follows: Part 1 general information (6 items), Part 2 measurement of knowledge about environmental health (20 items) with yes/no answer choices, Part 3 measurement of perception about environmental health (30 items), and Part 4 measurement of behaviors related to environmental health (15 items) using a 4-level rating scale. To study the environmental health behaviors of older people, the researchers validated the quality of the instrument for content validity by three experts in qualitative research to find the Index of Item-Objective Congruence (IOC) according to the formula of [10]. The scoring criteria were set at three levels: score +1 if the questionnaire is consistent with the objectives or content, score -1 if the content is inconsistent with the objectives or content, and score 0 if unsure whether the questionnaire is consistent with the goals or content. If the content validity or IOC value is more significant than 0.5, the researchers will use it as a question in the questionnaire. The result of calculating the consistency index of the questionnaire items with the research objectives was 0.90, so the questionnaire could be used for data collection.

3) Reliability testing: the reliability of the interview form was tested with 30 people in Ban Mai Subdistrict, Muang District, Chachoengsao Province. For the reliability of the questionnaire with rating scale characteristics, Cronbach's Alpha Method [11]was used. It was found that the reliability of the environmental health knowledge measurement was 0.78, the reliability of the environmental health perception measurement was 0.89, and the reliability of the environmental health behaviors measurement was 0.86.

4) Data collectionto develop a model for promoting environmental health behaviors that affect the health of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province, was divided into two stages as follows:

Phase 1: research studies environmental health behaviors that affect the health of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province. The sample group consisted of 30 older adults who were member leaders of the Pak Nam Subdistrict senior club, Bang Khla District, Chachoengsao Province. Data collection using questionnaires as a tool to study causal factors in terms of knowledge and perception that affect environmental health behavior and primary health care systems that affect the health of the older people in the area, data on the environmental health situation and essential public health systems, which studied issues of waste management, water supply,and drinking water management, insect and disease vector management, wastewater management, chemical management.

Phase 2: research development of a model for promoting environmental health behaviors that affect the health of older adults. The sample group consisted of 30 older member leaders of the Pak Nam Subdistrict senior club, Bang Khla District, Chachoengsao Province. They participated in workshops and focus group discussions to enable the older people to express their opinions according to their needs and to exchange knowledge with the researcher in primary health care system waste management, water supply and drinking water management, insect and disease vector management, wastewater management, chemical management and management of facilities for the older people to develop environmental health behavior models appropriate for the older people and provide policy recommendations to relevant local government agencies to apply the developed models in their areas.

5) Interpretation and data analysis:

5.1)Interpretation of the questionnaire results: Part 1 general information was interpreted using frequency distribution. Part 2 measurement of knowledge about environmental health was scored as follows: for positive questions, answer "yes" = 1 point, answer "no" = 0 points; for negative questions, answer "yes" = 0 points, answer "no" = 1 point. Part 3 measurement of perception about environmental health used a 4-level rating

scale: strongly agree = 4 points, agree = 3 points, disagree = 2 points, strongly disagree = 1 point. Part 4, measurement of behaviors related to environmental health, used a 4-level rating scale: practice every day = 4 points, practice often = 3 points, practice sometimes = 2 points, never practice = 1 point. The interpretation criteria for scores in parts 3 and part 4 were considered overall with an interval scale measurement level, dividing the score levels based on [12]criteria, interpreted into four levels using the formula for calculating the width of the class interval, with the following average criteria: mean 3.51 - 4.00 = highest level, mean 2.51 - 3.50 = high level, mean 1.51 - 2.50 = moderate level, and mean 1.00 - 1.50 = low level.

5.2) Statistical analysis: In phase 1, data were analyzed using a statistical software package to analyze mean, percentage, and standard deviation (S.D.) for causal factors between knowledge and perception affecting environmental health behaviors and health of older people using Pearson's Correlation Coefficient. In Phase 2, data from the research results in Phase 1 were analyzed, along with content analysis from the results of the focus group discussions.

3. Results and Discussion

The study of environmental health behaviors of older adults.

Part 1: General information and bio-social characteristics of the sample group showed that most of the older people sampled were female, accounting for 73.30%, with an average age of 67. Most were married, accounting for 46.67%. Regarding education level, the majority completed lower primary education, accounting for 60%. Most were engaged in agriculture, accounting for 43.33%. The sample group had risks of non-communicable chronic diseases in the top 3 rankings: high blood lipids (86.67%), hypertension (83.33%), and risk of diabetes (60%).Someolder adults did not exercise, accounting for half of the sample group.

Part 2: measurement of knowledge level about environmental health, consisting of 20 items with a total score ranging from 0 to 20 points. The actual scores (minimum-maximum) ranged from 10 to 20 points, with a group mean of 17.63 and a standard deviation (S.D.) of 2.63. Higher scores indicate higher knowledge about environmental health. The score levels for knowledge about environmental health are as follows:high knowledge level (scores between 18.95 to 20.00 points), moderate knowledge level (scores between 16.32 to 18.94 points), and low knowledge level (scores between 10.00 to 16.31 points). The results of measuring the level of knowledge about environmental health among older adults showed that most of the sample group had a high level of knowledge about environmental health, with 14 people accounting for 46.70%, as shown in Table 1.

Table 1 Level of knowledge about the environmental health of the target group.

Level of knowledge about environmental health	Number of people	Percentage
High level	14	46.70
Moderate level	7	23.30
Low level1	9	30.00

Mean = 17.63, S.D. = 2.63, Highest score = 20.00, Lowest score = 10.00.

Part 3: measurement of perception level about environmental health, consisting of 30 items with a total score ranging from 30 to 120 points. The actual scores (minimum-maximum) ranged from 77 to 113 points, with a group mean of 99.80 and a standard deviation (S.D.) of 9.32. Higher scores indicate a higher perception of environmental health. The score levels for perception of environmental health are as follows:high perception level (scores between 104.46 to 113.00 points), moderate perception level (scores between 95.15 to 104.45 points), and low perception level (scores between 77.00 to 95.14 points). The results of measuring the level of perception about environmental health among older adults showed that most of the sample group had a high level of perception about environmental health, with 11 people accounting for 36.70%. Considering the proportion of perception levels at high, moderate, and low, they were at similar levels, as shown in Table 2.

Table 2 Level of perception about the environmental health of the target group.

Level of perception about environmental health	Number of people	Percentage
High level	11	36.70
Moderate level	9	30.00
Low level1	10	33.30

Mean = 99.80, S.D. = 9.32, Highest score = 113.00, Lowest score = 77.00.

Part 4: Measurement of behavior levels related to environmental health, consisting of 15 items with a total score ranging from 15 to 60 points. The actual scores (minimum-maximum) ranged from 27 to 56 points, with a group mean behavior level of 49.23 points and a standard deviation (S.D.) of 7.31. The score levels for behaviors related to environmental health are as follows:high level (scores between 52.89 to 56.00 points), moderate level (scores between 45.58 to 52.88 points), low level (scores between 27.00 to 45.57 points). The results of measuring the level of behaviors related to environmental health among older adults showed that the sample group had the highest moderate level of environmental health, with 15 people accounting for 50.00%, as shown in Table 3.

Table 3 Level of behaviors related to the environmental health of the sample group.

Behavior related to environmental health	Number of people	Percentage
High level	11	36.70
Moderate level	15	50.00
Low level1	4	13.30

Mean = 49.23, S.D. = 7.31, Highest score = 56.00, Lowest score = 27.00.

The results of the correlation coefficient analysis between variables, including knowledge about environmental health and level of perception about environmental health, with environmental health behaviors in the older group, found that the relationship of the studied variables, namely knowledge about environmental health and level of perception about the environmental health of the sample group, had a relationship with environmental health behaviors of the sample group that was statistically significant at the 0.05 level, as shown in Table 4.

Table 4 Correlation coefficients between knowledge about environmental health and level of perception about environmental health with environmental health behaviors.

Studied Variables	Correlation Coefficient (r)
	Environmental Health Behavior
Knowledge about environmental health	0.39*
Perception about environmental health	0.40*

*$p < 0.05$

Most older people had high levels of knowledge and perception about environmental health and moderate levels (frequent practice) of behaviors related to environmental health. This is consistent with the research of [13], which found that most older people had health-promoting behaviors, with frequent practice in spiritual development, stress management, health responsibility, food consumption and nutrition, and occasional practice in exercise. It also aligns with [14], who found that factors supporting and facilitating health promotion by applying concepts of social cognitive theory and social ecology model are divided into five levels: 1) individual level: enhancing health literacy and health behaviors by integrating activities with local traditions, 2) interpersonal level: family members being good role models in desirable health behaviors, 3) organizational level: creating community health networks, public health volunteers, promoting local wisdom experts to use local wisdom skills, 4) community level: establishing sports grounds, parks, and organizing health fairs in local traditional events, 5) policy level: continuously communicating health literacy information through social media. Furthermore, [15]explained that guidelines for arranging appropriate and safe environments or facilities for older adultsmust be adaptable according to the suitability of the area or the availability of local resources or equipment. It is necessary to promote the cooperation of relevant agencies at

all levels and encourage the private sector to support and invest in creating environmental conditions in places that are conducive to older adults' lives.

Developing a model for promoting environmental health behaviors that affect the health of older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province.

The results from small group meetings and group discussions with 3 0older adults in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province, and ten representatives from government agencies related to environmental health to jointly determine guidelines and develop a model for promoting environmental health behaviors that affect health according to the needs of the sample group, established participatory guidelines for essential public health management covering seven areas, as follows**:**

1) Waste management: Increase the number of waste disposal points and public waste bins to cover the area. Implement segregated waste collection for disposal. Establish measures for those who illegally dump waste in unauthorized public regions. Promote training for older people on waste management, waste segregation, and waste recycling for utilization.

2)Water supply and drinking water management: improve the quality of tap water and drinking water to ensure year-round availability and quality. Conduct random sampling of tap water quality to analyze contaminants in water.

3) Insect and animal vector management: organize activities to prevent and solve problems of insect and animal vector outbreaks to inform older adults about the dangers and diseases from insect and animal vectors.

4)Wastewater management: encourage shops and food vendors to install primary wastewater treatment systems, such as grease traps, before discharging wastewater into drainage systems to reduce the problem of stagnant water in public drains.

5) Chemical management: organize training for older people on proper and safe storage and use of household chemicals, methods of self-protection, and first aid in case of chemical contamination.

6) Air quality management: organize training for older people on self-protection from airborne dust particles. Reduce burning of waste and agricultural residues in open areas and provide designated areas for burning waste in specific incinerators.

7) Management of facilities for older people: organize training on guidelines for improving landscapes and facilities in homes for hygienic living. Improve basic facilities in government offices. Educate older people on the proper and safe use of online media.

The researchers have established guidelines for community participation covering all four aspects: decision-making, implementation, utilization, and evaluation. The concepts of active aging and health beliefs were used to help design a model appropriate to the community context. This allows older people to participate as a central committee to propose guidelines for promoting environmental health behaviors through various projects/activities coveringfundamental public health aspects. It promotes their knowledge about environmental health through the dissemination of environmental health perception manuals, as well as raising awareness among older people about the benefits of proper environmental health management and essential public health in waste and excreta management, water supply and drinking water management, wastewater management, insect and animal vector management, air quality management, chemical management, and management of facilities for the older people. This creates a model for promoting environmental health behaviors that affect health appropriately for the community context, resulting in a good quality of life for older people, a good environment, and reducing inequalities in older adults' living conditions, as shown in Figure 1**.**

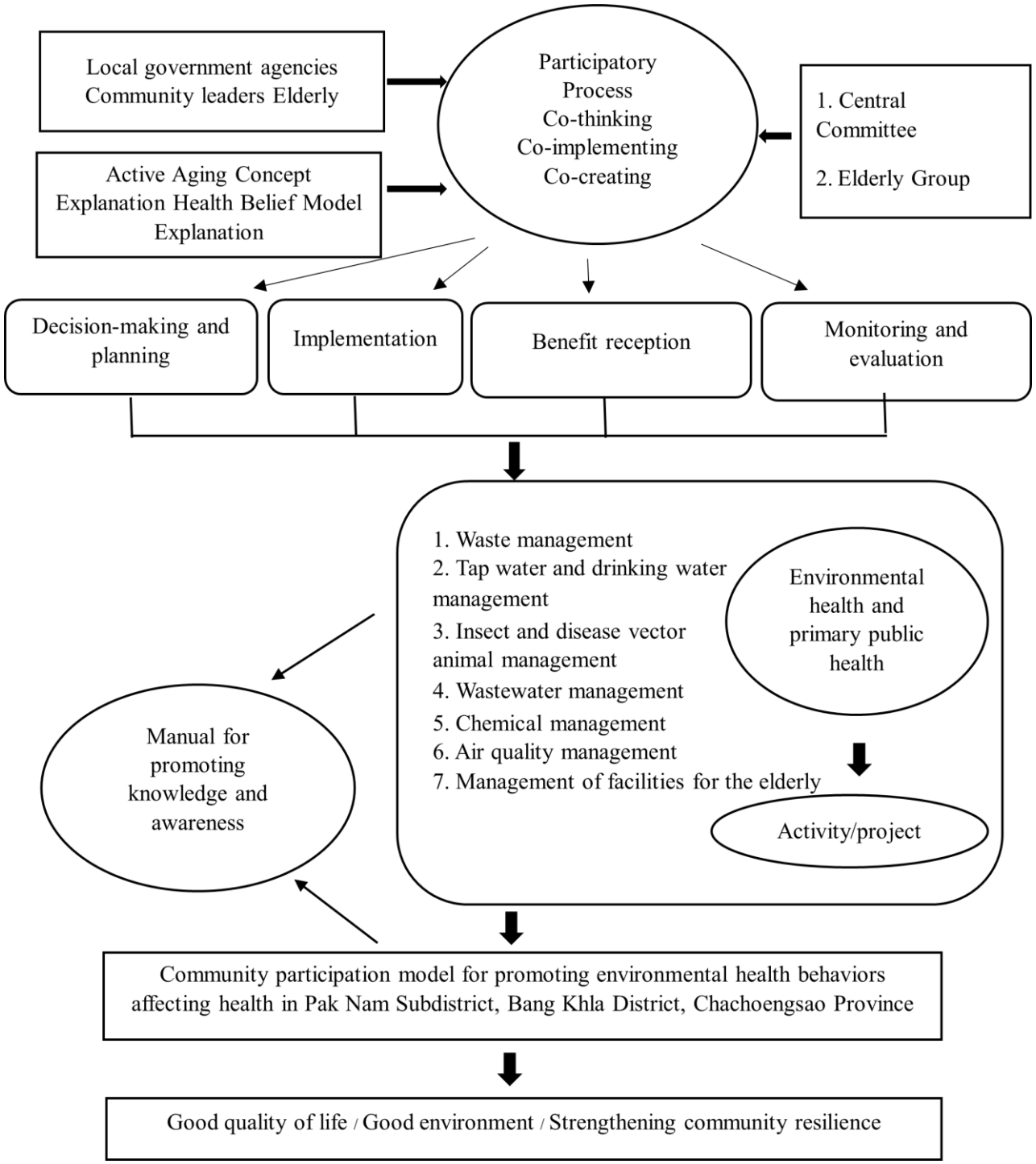

Figure 1 Model for promoting environmental health behaviors that affect the health of older people in Pak Nam Subdistrict, Bang Khla District, Chachoengsao Province**.**

The researcher presented the model of older adults' participation in promoting environmental health behaviors that affect the health of the older adults as mentioned above to Pak Nam Subdistrict Municipality and local government agencies to be aware of and use this model to make policy recommendations for environmental health management in the community that affect the health of the older adultsboth in terms of water supply and drinking water quality, waste management, guidelines for prevention and control of insects and disease animals, guidelines for wastewater and air treatment in communities, and facilities installed in communities

for the older adults. Local government agencies can use the data from the research to develop short-term or long-term action plans to organize projects and activities to promote environmental health in the community, enabling older people to have appropriate health behaviors and a better quality of life. The researchers allowed older people in the area to participate in planning and determining guidelines and activities in environmental health management, including primary public health, resulting in a more systematic operating model. Older adultsorganized activities according to the plan, resulting in positive changes in environmental health behavior in the area. This is consistent with the research of [16], which found that the health promotion model for older people includes health status assessment, education through empowerment, knowledge exchange, and continuous health promotion operations covering physical, mental, and social aspects. Additionally, public health agencies and local government organizations should involve the community in promoting older health for continuity and sustainability in the community. This aligns with the research of [13], which found that the model for health promotion of older people through community participation consists of enhancing community potential in health care, providing health promotion services and risk screening, managing health knowledge in the community, and developing older people towards active aging. It also corresponds with [14], who found that the results of synthesizing the health promotion model in the community consist of 5 components: 1) enhancing health literacy, 2) having good role models, 3) strengthening the community, 4) creating health-conducive environments, and 5) creating public policies for health.

Suggestions from research

1. This model of promoting environmental health behaviors that affect the health of older people can be applied to determine the direction of future environmental health policy implementation in the Pak Nam Subdistrict.
2. Further studies should be conducted on specific issues in environmental health, including approaches to environmental pollution management and methods and activities that may affect the health behaviors of older adults.
3. The research results are data obtained from participation and expression of opinions of the older group socially attached in the Pak Nam Subdistrict, which has a semi-urban community context. Older adults are ready regarding time, financial status, and society. Therefore, there are limitations in applying the model obtained from this research to rural areas and remote areas where the primary health care system has yet to reach.

4. Conclusion

The study of environmental health behaviors of older people found that older people had a high level of knowledge about environmental health (46.70%), a high level of perception of environmental health (36.70%), and a moderate level of behaviors related to environmental health (practicing often) (50.00%). The correlation coefficient analysis between variables showed that the relationship of knowledge about environmental health and level of perception about environmental health had a statistically significant relationship with environmental health behaviors of the sample group at the 0.05 level. The development of a model for promoting environmental health behaviors that affect the health of older adults applied concepts of active aging and health beliefs. The older people participate in decision-making, implementation, utilization, and evaluation by appointing older leaders as a central committee to propose guidelines and organize activities that promote appropriate environmental health behaviors that affect health, emphasizing essential public health management in hygienic communities, waste management to reduce the amount of residual waste in the community, appropriate quality of water supply and drinking water, insect and disease vector control to reduce the spread of germs, wastewater, and air management, and correct use of chemicals, and providing community facilities for the older adults to reduce inequality in the lives of the older people, resulting in the older adults having appropriate health behaviors, having a better quality of life and well-being.

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