ปัจจัยที่มีผลต่อพฤติกรรมการป้องกันโรคติดเชื้อไวรัสโคโรนา 2019 ของผู้สูงอายุโรคเบาหวาน
Factors Affecting Behaviors for Corona Virus Disease 2019 Prevention of Older Adults with Diabetes Mellitus

นิพนธ์ต้นฉบับ

ศตวรรษ อุดรศาสตร์[1], พรรณงาม วรรณพฤกษ์[2]*, อรทัย พงษ์แก้ว[1] และ กุมาลีพร ตรี สอน[1]

[1] คณะพยาบาลศาสตร์ มหาวิทยาลัยราชภัฏร้อยเอ็ด อ.เสลภูมิ จ.ร้อยเอ็ด 45120
[2] คณะพยาบาลศาสตร์ มหาวิทยาลัยราชธานี อ.เมือง จ.อุบลราชธานี 34000

* Corresponding author: panngam2772@gmail.com

Original Article

Sattawas Udonsat[1], Panngam Wannapuek[2]*, Orathai Pongkaew[1] and Kumaleeporn Treesorn[1]

[1] Faculty of Nursing, Roi Et Rajabhat University, Selaphum, Roi Et, 45120, Thailand
[2] Faculty of Nursing, Ratchathani University, Mueang, Ubon Ratchathani, 34000, Thailand

* Corresponding author: panngam2772@gmail.com

บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาระดับและปัจจัยทำนายพฤติกรรมการป้องกันโรคติดเชื้อ โควิด-19 ของผู้สูงอายุโรคเบาหวาน **วิธีการศึกษา:** การวิจัยความสัมพันธ์เชิง ทำนาย มีกลุ่มตัวอย่าง คือ ผู้สูงอายุโรคเบาหวาน 135 ราย ที่รับบริการที่ โรงพยาบาลส่งเสริมสุขภาพตำบลบ้านขวาว อ.เสลภูมิ จ.ร้อยเอ็ด ใช้การสุ่ม ตัวอย่างอย่างง่าย รวบรวมข้อมูลโดยใช้แบบสอบถามความรู้เกี่ยวกับการปฏิบัติตัว เพื่อป้องกันโรคฯ ทัศนคติเกี่ยวกับโรคฯ การสนับสนุนทางสังคม นโยบายที่เอื้อต่อ การปฏิบัติตัว การได้รับข่าวสารจากสื่อ และพฤติกรรมการป้องกันโรคติดเชื้อไวรัส โคโรนา 2019 14วิเคราะห์ข้อมูลโดยใช้การถดถอยพหุคูณ **ผลการศึกษา:** กลุ่ม ตัวอย่างมีพฤติกรรมการป้องกันโรคติดเชื้อโควิด-19 อยู่ในระดับสูง (mean = 48.28 จาก 60 คะแนน) โดยความรู้เกี่ยวกับการปฏิบัติตัวเพื่อป้องกันโรคฯ (β = 0.352) ทัศนคติเกี่ยวกับโรคฯ (β = 0.314) การสนับสนุนทางสังคม (β = 0.277) การรับข่าวสารจากสื่อ (β = 0.172) และนโยบายที่เอื้อต่อการปฏิบัติตัว (β = 0.139) สามารถร่วมกันทำนายพฤติกรรมการป้องกันโรคติดเชื้อไวรัสโคโรนา 2019 ของผู้สูงอายุโรคเบาหวานได้ร้อยละ 63.00 (R^2 = 0.630, F = 44.019, P-value < 0.001) **สรุป:** ความรู้ ทัศนคติ การสนับสนุนทางสังคม การรับข่าวสาร จากสื่อ และนโยบาย สามารถทำนายพฤติกรรมการป้องกันโรคติดเชื้อไวรัสโคโร นา 2019 ของผู้สูงอายุโรคเบาหวานได้ สามารถนำปัจจัยเหล่านี้ไปส่งเสริม พฤติกรรมการป้องกันโรคติดเชื้อโควิด-19 ของผู้สูงอายุโรคเบาหวาน

คำสำคัญ: พฤติกรรมการป้องกัน, โรคติดเชื้อไวรัสโคโรนา 2019, โควิด-19, ผู้สูงอายุโรคเบาหวาน

Abstract

Objective: To determine level of and factors affecting the behavior for Covid-19 prevention of older adults with diabetes mellitus. **Method:** In this predictive correlational research, 135 participants attending the Bankwaw Sub-district Health Promoting Hospital, Selaphum district, Roi-Et province, were selected by simple random sampling. Questionnaire was used to assess knowledge about Covid-19, attitude about Covid-19, social support, health promoting policy, gained information, and behaviors for Covid-19 prevention. Multiple regression was used to test the association. **Results:** Participants had a high level of behavior for Covid-19 prevention (mean = 48.28 out of 60 points). knowledge about Covid-19 (β = 0.352), attitude about Covid-19 (β = 0.314), social support (β = 0.277), gained information (β = 0.172) and health promoting policy (β = 0.139) significantly predicted 63.00% the behavior (R^2 = 0.630, F = 44.019, P-value < 0.001). **Conclusion:** Knowledge, attitude, social support, gained information and health promoting policy predicted the behavior for Covid-19 prevention. Findings could be used for promoting Covid-19 preventive behavior among diabetic elderly.

Keywords: behaviors for prevention, corona virus disease 2019, older adults with diabetes mellitus

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Introduction

Coronavirus disease 2019 (Covid-19) has been a worldwide pandemic. The cumulative number of 555,446,890 infected cases and 6,353,692 deaths have been reported worldwide.[1] In Thailand, 4,550,924 cumulative cases and 30,907 deaths have been reported.[2] In addition to vaccination for Covid-19 for all age groups, lifestyle modification is also promoted to prevent the infection and spreading. The most susceptible groups for infection and severe or life-threating infection include individuals with old age, chronic illnesses,

pregnancy, age of 6 months to 2 years, disability, thalassemia, immune deficiency, and obesity.[3]

Covid-19 infection preventing behavior is highly crucial for these high-risk groups especially the elderly with diabetes which usually have a high risk for more severe or life-threatening infections.[4] In the elderly with diabetes, the risk of Covid-19 infection has been increased by 14%.[5] This heightened risk of infection in the elderly with diabetes has been a result of physiological degeneration including immune system.[6,7] With an uncontrolled high glucose level, virus could

infect more readily since it needs glucose for its metabolism. This high glucose level also allows more hyperinflammation. Covid-19 infection diabetes patients have been associated with 14 – 32% of severe complications.[9] A study in hospitals revealed that among hospitalized patients with Covid-19 infection, 72% of them were the elderly with diabetes.[10] A study in Covid-19 infected patients with acute respiratory failure showed that the risk among those with diabetes was 2.34 times of those without diabetes (hazard ratio or HR of 2.34, 95% CI = 1.35 to 4.05, P-value = 0.002).[11] These evidence suggests the need for self-care to prevent Covid-9 infection in the elderly with diabetes.

Recommendations for self-care for Covid-19 prevention for the elderly and diabetes patients have been provided.[12,13] Individuals are advised to wash hands with soap and water or alcohol gel before and after meal and after restroom use, to avoid having hands touch face, eyes, mouth or nose, to have freshly heat-prepared foods, to not use personal spoon for the shared food, and to better self-manage stress. When coughing or sneezing, it is advised to cover mouth or nose with tissue paper, put it in the plastic bag, and seal and discard the bag. The patients are also advised to avoid going outside or to crowded places. If necessary, mask should be worn and a distance should be kept for 1 – 2 meters or 6 feet. Hugging or talking at a close distance should be avoided. Medications for diabetic control should be adequately reserved, and blood glucose level should be well controlled. The patients should be adequately hydrated, regularly exercise, and have an adequate rest.[12,13] These recommendations are supposed to help prevent Covid-19 infection among the elderly with diabetes. However, the success of behavioral changes is influenced in part by various factors. Since the behavioral changes to prevent Covid-19 prevention have not been among the elderly with diabetes have not been known, there is a need to determine which factors could play a significant roles in helping people modify their behavior.

Factors affecting the Covid-19 infection prevention behavior were subject to exploration in our present study. These factors were based on the Precede–Proceed Model of Green and Kreuter (1999).[14] According to Precede-Proceed Model, health behaviors are influenced by three kinds of factors namely predisposing, reinforcing, and enabling factors which exert different effects on behavioral changes.[15] In this study, relevant selected predisposing factors based on literature review included age, knowledge, and attitude, while reinforcing factors included social support and media-based information. Finally, practice enabling policy was the selected enabling factor in this study.

As a predisposing factor of PRECED-PROCEED Model, age is significantly, positively associated with health behavior.[16] Individuals have learned and experienced more with age through formal and informal education, training, and real-life events. The accumulated knowledge with age allows the person to better their self-care. Knowledge, as the second predisposing factor, could be from education, information, and experience. Education enhances understanding and subsequent behavioral manifestation.[15] A previous study suggests that education was associated with Covid-19 prevention behavior.[17] Attitude was defined as the thought and belief of the elderly toward Covid-19 infection which could be both positive and negative. Their attitude could affect the decision to change their behavior in preventing Covid-19 infection as shown in previous studies. [18,19]

For reinforcing factors, social support was defined as the perception of the individual on financial support, resources, daily activities, and encouragement for Covid-19 infection prevention. It was also defined as support for living from family members, health volunteers and healthcare providers. Social support was found to be positively associated with health behavior.[20] Media-based information was the individual's perception on receiving Covid-19 information via various media such as newspaper, radio, television, social media and healthcare providers. [21,22] For the enabling factors, practice-enabling policy refers to the guidelines in health-promoting activities of the community service center. The activities include health promotion and facilitation for the promotion campaign. It is expected that with adequate policy support, health promoting activities of individuals are facilitated. Health promotion enabling policy was found to be associated with health promoting behaviors of the elderly.[23] In this present study, Bankwaw subdistrict, Selaphum district, Roi-et province was selected for exploration. With 977 cumulative cases in the region, the study population could adequately represent a small geographical area with relatively prevalent infection.[24] The associations between selected factors and the Covid-19 prevention behavior could be somewhat reliable. The findings could be useful in planning health behavior modification interventions to promote Covid-19 prevention behavior.

Specifically, the study aimed to determine level of Covid-19 infection prevention behavior among the elderly with

diabetes. The study also aimed to examine the association between each of the selected factors and the behavior. In terms of conceptual framework, predisposing, reinforcing, and enabling factors based on Precede–Proceed Model of Green and Kreuter14 were hypothesized to be associated with Covid-19 prevention behavior. Predisposing factors included age, knowledge about Covid-19 prevention, and attitude about Covid-19 infection. Reinforcing factors included social support and information provided by media. Finally, enabling factor was practice enabling policy.

Methods

In this predictive correlational research, study population was diabetes patients who were 60 years old or older receiving care at the Bankwaw Sub-district Health Promoting Hospitals, Bankwaw sub-district, Selaphum district, Roi-et province. Study sample was those in the study population who met the inclusion criteria as follows. They had to be 60 years old or older, diagnosed with type 2 diabetes, with good consciousness, and able to communicate. Individuals who had severe complications of hypoglycemia (i.e., sweating, palpitation, or loss of consciousness).

The sample was based on the power analysis using the software program G*power 3.1.9.4.[25] The estimation was based on linear multiple regression (fixed model, R^2 deviation from zero). With an effect size (f^2) of 0.15 [26] for unknow proportion of the dependent variable, a type I error of 5%, a power of test of 90%, and 6 predictive factors, a total of 123 participants were needed. With 10% additional participants to compensate for incompletely filled questionnaires, a total of 135 participants were required. Prospective participants were selected with simple random sampling without replacement.

Research instruments

The self-administered questionnaire contained 7 parts. Part 1 collected demographic and clinical characteristics of the participants including age, gender, marital status, education level, co-morbidities, duration of diabetes since diagnosis, and co-habitants.

Part 2 assessed knowledge about Covid-9 prevention developed by the researcher as guided by the literature. The 18 questions asked about the spreading of Covid-19, signs and symptoms of the disease, and protocols for disease prevention. The response was "true" or "false." The score of 1 point was rewarded for a correct answer and 0 otherwise. With the possible total scores of 0 to 18 points, levels of knowledge were categorized as low, moderate and high (0 – 6, 7 – 12, and 13 – 18 points, respectively).

Part 3 assessed attitude toward Covid-19 infection developed by the researcher as guided by the literature. The 10 questions asked about feeling, perception and beliefs of the participant. The response was a 4-point rating scale ranging from 0-disagree, to 1-not sure, 2-agree, and 3-highly agree. With the possible total scores of 0 – 10 points, levels of attitude were categorized as low, moderate, and high (0 – 10, 11 – 20, 21 – 30 points, respectively).

Part 4 assessed social support using a questionnaire of Suksamai et al. (2012).[23] The 10 questions asked about perceived encouragement for disease prevention practice, financial support, resource support, support on daily activities of living, and psychological support from village health volunteers, family members, and healthcare providers. The response was a 4-point rating scale of frequency ranging from 0-never, to 1-rarely, 2-sometimes, and 3-always. With the possible total scores of 0 – 30 points, levels of social support were categorized as low, moderate and high (0 – 10, 11 – 20, and 21 – 30 points, respectively).

Part 5 assessed perception of the policy promoting disease prevention practice modified from the questions of Suksamai et al.[23] The 5 questions asked about the policy including service, campaign activities, promotion, and for promotion. The response was 1-yes and 0-no for the perceived policy. With the possible total scores of 0 – 5 points, levels of perceived policy were categorized as low, moderate and high (0 - 1.66, 1.67 - 3.33, and 3.34 - 5.00 points, respectively).

Part 6 asked about perceived information by the media with questions developed by the researcher as guided by the literature. The 15 questions asked about information received by the participant about Covid-19 prevention advice from various media both corporate media, individuals' social media, and community media. The response was a 4-point rating scale reflecting how often the information was received ranging from 0-never, to 1-rarely, 2-sometimes, and 3-often. With the possible total scores of 0 – 45 points, levels of perceived information were categorized as low, moderate, and high (0 – 15, 16 – 30, and 31 – 45 points, respectively).

Part 7 assessed the behavior of Covid-19 prevention among diabetic elderly with questions developed by the researcher as guided by the WHO recommendations[3] and Department of Health, Ministry of Public Health of Thailand.[12,13] The 20 questions asked about practice of diabetic elderly in their activities of daily living to prevent Covid-19 including correct handwash, avoiding face touching, proper diet, mental health promotion, proper handling of cough and sneeze, proper face masking, social distancing, adequate supply of medicines, good glycemic control, and regular exercise. The response was a 4-point rating scale reflecting the frequency of the practice ranging from 0-never, to 1-sometmes, 2-most of the time, and 3-regularly. With the possible total scores of 0 – 60 points, levels of the behavior were categorized as low, moderate, and high (0 – 20, 21 – 40, and 41 – 60 points, respectively).

Research instrument quality assurance

Parts 2 to 7 of the questionnaire (i.e., knowledge about Covid-9 prevention, attitude toward Covid-19 infection, social support, perception of the policy promoting disease prevention practice, perceived information by the media, and the behavior of Covid-19 prevention) were examined for content validity by three experts of nursing care for the elderly with chronic diseases. The content was found to be valid with the Content Validity Index for Scale (S-CVI) of 0.95, 0.93, 0.90, 0.94, 0.92 and 0.96, respectively. The revised questionnaire was tested for internal consistency reliability in 30 individuals with characteristics comparable with the participant. The second part (i.e., knowledge about Covid-9 prevention) was found to have appropriate difficulty with the index of 0.53 to 0.80. Internal consistency reliability of this knowledge part was acceptable with a Kuder-Richardson-20 (KR-20) index of 0.76. Parts 3 to 7 also had high internal consistency reliability with Cronbach's alpha coefficients of 0.81, 0.95, 0.80, 0.88 and 0.82, respectively.

Participant's ethical protection and data collection procedure

The study was approved by the Ethics Committee for Human Study of Roi Et Rajabhat University (approval number: 020/2565; approval date: June 4, 2021 t June 3, 2022). Permission from the director of Bankaw sub-district health promoting hospital, Selaphum district, Roi Et province was also granted. Prospective participants were approached on the day they had appointed office visit. Data collection was done on Monday, Wednesday and Friday. The researcher introduced himself and provided information of objectives, process, and voluntary nature of the study to the prospective participants. After written informed consent form was signed, the participant was asked to complete the self-administered questionnaire which took about 20 – 30 minutes.

Data analysis

Descriptive statistics including frequency with percentage and men with standard deviation (SD) were used to summarize demographic characteristics and study factor scores of the participants. Associations between score of behavior for COVID-19 prevention and its predictive factors (i.e., age, knowledge about Covid-9 prevention, attitude toward Covid-19 infection, social support, perception of the policy promoting disease prevention practice, and perceived information by the media) were tested using stepwise multiple linear regression analysis. Assumptions of multiple linear regression analysis were met. Statistical significance was set a type I error of 5% (or P-value < 0.05). All statistical analyses were performed using software program SPSS 20.0.

Results

Of the 135 participants, the majority were in their 60 - 69 years of age (52.60%). They were 70.21 (SD = 7.98) years by average. Majority were women (59.30%), married (67.40%), with primary education (80.70%), with hypertension (44.40% followed by hypertension and hyperlipidemia (20.70%), diagnosed with diabetes for 1 – 5 years (41.50%) followed by 6 – 10 years (28.10%), and living with offspring (51.10%) (Table 1).

Most predictive factors were at a high level; except perceived information by the media which was at a moderate level. Mean score of the behavior for COVID-19 prevention was 48.28 out of the total of 60 points (or 80.47%) (Table 2).

Multiple linear regression analysis showed that the five factors together significantly predicted 63.00% of variance of the behavior for COVID-19 prevention ($R^2 = 0.630$, F = 44.019, P-value < 0.001) (Table 3). The factor with the highest influence in predicting the behavior was knowledge about Covid-9 prevention ($\beta = 0.352$, P-value < 0.001), followed by attitude toward Covid-19 infection ($\beta = 0.314$, P-value <

0.001), while the rest were with a lesser influence. Age was not associated with the behavior (P-value < 0.05), so it was not shown in the table (Table 3).

Table 1 Demographic and clinical characteristics (N = 135).

Characteristics	N	%
Age (years)		
60 – 69	71	52.60
70 – 79	41	30.40
80 or older	23	17.00
(mean = 70.21, SD = 7.98, Min = 60, Max = 89.		
Gender		
Men	49	36.30
Women	80	59.30
Marital status		
Single	6	4.50
Married	91	67.40
Widowed/divorced/separated	38	28.10
Education		
Primary school	109	80.70
High school	10	7.40
Associate degree	1	0.70
Bachelor's degree	6	4.40
Co-morbidities (more than 1 was applicable)		
No	19	14.10
Yes		
Hypertension	60	44.40
Hyperlipidemia	18	13.30
Chronic kidney disease	4	3.00
Hypertension and chronic kidney disease	4	3.00
Hypertension and hyperlipidemia	28	20.70
Hypertension and cerebrovascular disease	2	1.50
Number of years of diabetes		
1 – 5	56	41.50
6 – 10	38	28.10
11 or greater	41	30.40
(mean = 9.47, SD = 7.58, Min =1, Max = 40.		
Living arrangement		
Living alone	4	3.00
Living with spouse	28	20.70
Living with offspring	69	51.10
Living with spouse/offspring	34	25.20

Table 2 Scores and levels of study factors (N = 135).

Factors	Mean	SD	Level
Knowledge about Covid-9 prevention	16.40	1.42	High
Attitude toward Covid-19 infection	27.26	1.21	High
Social support	25.48	2.89	High
Perceived policy promoting disease prevention	4.51	0.70	High
Perceived information by the media	21.44	8.92	Moderate
Behavior for COVID-19 prevention	48.28	7.59	High

Table 3 Associations between behavior for COVID-19 prevention and its predictive factors by multiple linear regression analysis (N = 135).

Factors	b	SE	β	t	P-value
Knowledge about Covid-9 prevention	1.879	0.331	0.352	5.670	< 0.001
Attitude toward Covid-19 infection	1.972	0.366	0.314	5.391	< 0.001
Social support	0.726	0.154	0.277	4.727	< 0.001
Perceived information by the media	0.146	0.52	0.172	2.805	0.006
Perceived policy promoting disease prevention	1.505	0.667	0.139	2.256	0.026

R = 0.794, R^2 = 0.630, adjusted R^2 = 0.616, F = 44.019, P-value < 0.001.

Discussions and Conclusion

The behavior of Covid-19 prevention in diabetic elderly was at a high level with a mean score of 48.28 points (SD=7.59) out of 60 points (or 80.47%). This high level of the behavior of preventing Covid-19 could be attributable to the worldwide pandemic regardless of specific demographics. The elderly with diabetes are a group highly susceptible for infection and a severe disease with a high risk to be life-threatening.[4] The Covid-19 pandemic affected everyone with all measures imposed by the government and private organizations. Information and advice was disseminated continuously through various media to strengthen the understanding on the importance and severity of the disease. Preventive measures were emphasized including handwashing, face masking, social distancing, and health promotion. The elderly could also be exposed to the advice and information, hence a high level of the Covid-19 preventive behavior. This finding is consistent with previous studies revealing that Covid-19 preventive behavior in the elderly was at a high level.[27,28]

Knowledge about Covid-19 prevention practice could predict the behavior of preventing the disease in diabetic elderly significantly (P-value < 0.05). This could be because knowledge based on the Precede–Proceed Model of Green and Kreuter (1999)[14] is the basis for emerging and motivating the behavior. Knowledge comes from learning, research, training, information and experience. With understanding brought by knowledge, individuals are promoted or prohibited to perform the health behavior.[15] Diabetic elderly equipped with knowledge would have Covid-19 preventive behavior. This finding is consistent with the work of Khumsaen where knowledge was associated with Covid-19 preventive behavior[17] and a work of Widowati and Raushanfikri revealing that knowledge was one of the factors predicting Covid-19 preventive behavior.[18]

Attitude toward Covid-19 could significantly predict the behavior (P-value < 0.05). Based on the Precede–Proceed Model of Green and Kreuter (1999), attitude is the feeling, perspective, thought and beliefs of the individuals toward matters resulting in both positive and negative influence on behavior modification.[14] The diabetic elderly had a high level of positive attitude toward Covid-19 suggesting that they had perspectives and beliefs that allowed them to prevent Covid-19. They thus showed a high level of preventive behavior. This

finding is consistent with previous studies showing that attitude could predict Covid-19 preventive behavior.[18,19]

Social support significantly predicted the behavior of Covid-19 prevention (P-value < 0.05). Based on the Precede–Proceed Model, social support reinforced health behavior.[14] Social support is an externa l factor from others influencing the individual on the matter.[15] The elderly received social support at a high level to encourage them for carrying out the health behavior. Financial support, resource support, and motivation for living from village health volunteers, family members, and healthcare providers prompted the elderly for carrying out the behavior which resulted in reported high level of Covid-19 preventive behavior. This finding is consistent with a previous study revealing that social support from others inside and outside of the family and healthcare providers kept the elderly motivated, ready with materials and devices, and confidence and concern in performing the health behavior. Social support is associated with health behavior.[25] A study of Yodmai et al showed that family support and material support influenced Covid-19 preventive behavior among the elderly.[28]

The perception on information provided by various media significantly predicted the behavior of Covid-19 prevention (P-value < 0.05). Based on the Precede–Proceed Model, perception on information provided reinforced health behavior.[14] Perceived information is an external factor influencing the individual health behavior.[15] With advanced information and media technology, information dissemination and reception are easy, fast, convenient and invasive for all age groups. The elderly received information about severity of Covid-19 pandemic and impacts of the pandemic. This could make the elderly interested and concerned and urge them to perform the behavior to prevent the infection. The finding is consistent with previous studies showing that information from all media influenced the Covid-19 preventive behavior.[21,22]

Perceived policy promoting disease prevention could significantly predict the behavior of Covid-19 prevention (P-value < 0.05). Based on the Precede–Proceed Model, perceived policy reinforced health behavior.[14] Perceived policy is an environment-driven factor to directly influence the behavior either promoting or inhibiting. Promoting policy offers adequate materials and devices and facilitations, and access to necessary services and resources for health promotions.[15] Policy also provides protocol or guidance in community health centers such as service management, development of health promoting activities and campaign, and availability of place.

When the community health center issues policy to facilitate health behavior, the elderly were facilitated and hence their Covid-19 preventive behavior. The finding is consistent with the study of Suksamai et al showing that policy facilitating the behavior was associated with the behavior in the elderly.[23]

Age was not associated with the behavior (P-value > 0.05). Covid-19 is the new worldwide pandemic affecting individuals in all age groups. As a worldwide pandemic, governments of all countries put much effort to counter the spreading. All campaigns and measures to end the pandemic have been clear to all individuals to the point that everybody was aware of the pandemic. The elderly, either early, middle, or late, could have perceived all information and measures and acted according to such measures. Therefore, the elderly with different ages could have similar behavior to prevent Covid-19. This finding is consistent with the work of Jenlarpwattanakul revealing that age could not predict Covid-19 preventive behavior.[19]

From the findings, healthcare providers and responsible organizations could plan and develop activities suitable for local people with Covid-19 outbreak by educating about preventive behavior and severity of the disease. This could bring about concern and attitude toward preventive behavior. Materials and devices should be fully supported. Motivation and encouragement to sustain the preventive behavior should be continuously provided. Responsible organizations should provide advice and information through various media continuously, especially community channels. These measures could prevent the severe infection of Covid-19 and its complications in the elderly with diabetes.

For future research, studies with specific geographical areas should be conducted. Quasi-experimental studies to prove effectiveness of interventions that promote knowledge about Covid-19 prevention, attitude toward Covid-19, social support, perceived information from media, and perceived policy facilitating the behavior that further promote the preventive behavior should be conducted.

In conclusion, Covid-19 preventive behavior in diabetic elderly was at a high level. The behavior could be predicted by knowledge about Covid-19 prevention, attitude toward Covid-19, social support, perceived information from media, and perceived policy facilitating the behavior.

References

1. World Health Organization (WHO). Global COVID-19 (total) cases, deaths and vaccinations to date. 2021. (Accessed on Jul. 19, 2022, at https://cdn.who.int/media/docs/default-source/searo/thailand/2022_07_14_tha-sitrep-242-covid-19.pdf?sfvrsn=3ccb673e_1)

2. World Health Organization (WHO). COVID-19 Situation, Thailand. 2022. (Accessed on Jul. 19, 2022, at https://cdn.who.int/media/docs/default-source/searo/thailand/2022_07_14_tha-sitrep-242-covid-19.pdf?sfvrsn=3ccb673e_1)

3. World Health Organization (WHO). What is a coronavirus? 2022. (Accessed on Jul. 19, 2022, at https://www.who.Int/news-room/q-a-detail/q-a-coronaviruses)

4. Fajar NA, Putri G, Hasyim H. Analysis of COVID-19 prevention behaviour among diabetes mellitus comorbidity patients in Palembang. *Jurnal Promkes Indonesian J Health Promot Health Educ* 2021;9(2):168-176.

5. Faghir-Gangi M, Moameri H, Abdolmohamadi N, Nematollahi SH. The prevalence of type 2 diabetes in patients with COVID 19: a systematic review and meta-analysis. *Via Medica* 2020;9(5):271–278.

6. Eliopoulos C. Gerontological nursing, 9th ed. Philadelphia. Lippincott Williams & Wilkins, 2018.

7. Touhy TA, Jett KF. Ebersole and Hess' gerontological nursing & healthy aging, 5th ed. St. Louis. Elsevier/Mosby, 2018.

8. Brufsky A. Hypecerglymia, hydroxychloroquine, and the COVID-19 pandemic. *J Med Virol* 2020;92(7):770–775.

9. Singh AK, Gupta R, Ghosh A, Misra A. Diabetes in COVID-19: Prevalence, pathophysiology, prognosis and practical considerations. *Diab Metab Syndr Clin Res Revi* 2020;14(4):303-310.

10. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan. China. *J Am Med Assoc* 2020;323(11):1061-1069.

11. Wu C, Chen X, Cai Y, et al. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. *JAMA Intern Med* 2020;180(7):934-943.

12. Department of Disease Control. Diabetes mellitus and coronavirus disease 2019. 2019. 2021. (Accessed on Jul. 19, 2022, at https://ddc.moph.go.th/brc/news.php?news=20276&deptcode=brc&news_views=3608_) (in Thai)

13. Department of Health. Health education for elderly in Coronavirus disease 2019 situation. 2021. (Accessed on Jul. 19, 2022, at https://covid19.anamai.moph.go.th/web-upload/2xdccaaf3d7f6ae30ba6ae1459eaf3dd66/m_document/6734/34105/file_download/f58d7f01402d9b74c9c1982f80665644.pd) (in Thai)

14. Green LW, Kreuter MW. Health promotion planning an educational and ecological approach, 3rd ed. California. Mayfield Publishing Company, 1999.

15. Ua-Kit N, Pensri L. Utilization of the PRECEDE MODEL in health promotion. *Thai Red Cross Nurs J* 2018;12(1):38-48.

16. Choopan S. Factors related to self-care behaviors among social bound in Sra Takhe Sub-district Health Promotion Hospital, Banlang sub-district, Non Thai district, Nakhon Ratchasima province. *J Prim Health Care Northeast Ed* 2021;36(2):100-107. (in Thai)

17. Khumsaen N. Knowledge, attitudes, and preventive behaviors of COVID-19 among people living in amphoe U-thong, Suphanburi province. *J Prachomklao Coll Nurs Phetchaburi* 2021;4(1):33-48. (in Thai)

18. Widowati R, Raushanfikri A. Knowledge, attitude, and behavior toward COVID-19 prevention on Indonesian during pandemic. *Open Access Macedonian J Med Sci* 2021;9(E):398-401.

19. Jenlarpwattanakul J. Knowledge, attitude and COVID-19 preventive behavior of people in Ratchaburi province. *Instit Urban Dis Control Prev J* 2021;6(1):193-208. (in Thai)

20. Maton T, Saengngoen S. Factors associated with health promoting behavior among elderly in Sukhothai province, Thailand. *J Public Health* 2017;47(1):67-78. (in Thai)

21. Poonaklom P, Rungram V, Abthaisong P, Piralam B. Factors associated with preventive behaviors towards Coronavirus disease (COVID-19) among adults in Kalasin province, Thailand, 2020. *Outbreak Surveil Invest Resp J* 2020;13(3):78-89.

22. Inthacharoen A, Kanchanapoom K, Tansakul K, Pattapat S. Factors influencing preventive behavior towards coronavirus disease 2019 among people in Khohong Town Municipality Songkhla Province. *J Council Commun Public Health* 2021;3(2):19-30. (in Thai)

23. Suksamai N, Amnatsatsue K, Kerdmongkol P, Keawpan W, Vajanapoom N. Factors related to health promoting behaviors among information aging workers in Bangkok. *J Public Health Nurs* 2012;26(3):80-93. (in Thai)

24. Centre for COVID-19 Situation Administration's (CCSA). COVID-19 situation, Roi-et province. 2022. (Accessed on Jul. 19, 2022, at https://www.roiet.go.th/news-870.html) (in Thai)

25. Faul F, Erdfelder E, Lang AG, Buchner A. G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods* 2007;39(2):175-191.

26. Polit DF, Beck CT. Nursing research: principles and method. (7thed). Philadelphia. Lippincott Williams & Wilkins, 2003.

27. Bunthan W, Whaikit P, Soysang V, Soynahk C, Akaratanapol P, Kompayak J. Factor influencing to health promotion behavior for coronavirus disease 2019 (COVID19) prevention of older adults. *J Police Nurs* 2020;12(2):323-337. (in Thai)

28. 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*. 2021;12:1-9.