



## Factors Associated with Preventive Behaviors towards Coronavirus Disease (COVID-19) among Adults in Kalasin Province, Thailand, 2020

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### Abstract

Coronavirus disease (COVID-19) is a pandemic disease that has caused devastating morbidity and mortality worldwide. Social stigmatization in rural communities of Thailand prevented effective response to the pandemic. This study aimed to determine factors associated with preventive behaviors towards COVID-19 in Kalasin Province, Thailand. An analytic cross-sectional study was conducted among 556 local residents aged at least 15 years old. The questionnaire was developed based on Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation (PRECEDE) and media perception theories. Most of the residents were female (61.3%) and aged 15-70 years old (mean 37.9 years old, SD 11.7). All of the risk perception, severe perception, benefit perception, media perception, attitudes, and preventive behavior scores were at a good level whereas knowledge on COVID-19 was at a moderate level. Income ( $\beta$  0.10,  $p$  0.003), risk perception on COVID-19 ( $\beta$  0.20,  $p < 0.001$ ), media perception ( $\beta$  0.41,  $p < 0.001$ ), and attitudes toward COVID-19 ( $\beta$  0.24,  $p < 0.001$ ) were associated with preventive behaviors. These findings provide predicting factors of preventive behaviors towards COVID-19. Definite health education programs, especially for increasing accessibility on COVID-19 prevention, and effective policies should be implemented, particularly for low-income groups.

**Keywords:** coronavirus disease, preventive behaviors, Kalasin, Thailand

### Introduction

Coronavirus disease (COVID-19) has caused devastating morbidity and mortality worldwide.<sup>1</sup> As of 1 Sep 2020, more than 25 million confirmed COVID-19 cases have been reported globally with almost 848,255 deaths.<sup>2</sup> In Thailand, the national Centre for COVID-19 Situation Administration (CCSA) reported that the accumulatively confirmed COVID-19 cases up to 1 Sep 2020 was 3,417 cases with 58 deaths.<sup>3</sup>

With no specific treatment or a vaccine available, behaviors to prevent COVID-19 are necessary to be explored.<sup>4,5</sup> The Thai Ministry of Public Health (MOPH) has implemented five key measures for limiting the COVID-19 outbreak, including a country-wide lockdown, social distancing, mandatory wearing of face masks, observing hand hygiene and the regular cleaning of frequently touched surfaces with an antiseptic soap or detergent. However, a few

barriers have prevented the adoption of these behaviors by some members of the Thai community including dissemination of fake news, poor knowledge about the disease, social stigmatization, and the high cost of face masks and hand sanitizers.<sup>6</sup>

In Kalasin Province, there were three confirmed cases of COVID-19 that had been isolated in the hospital longer than stated in the COVID-19 treatment guidelines of Thailand.<sup>7</sup> Of the three cases, one was refused to return to the community and was sent to live in another province. This phenomenon revealed that stigmatization of COVID-19 was present in Thai society.<sup>6</sup> This was despite the CCSA in Kalasin Province updating the COVID-19 situation daily via Facebook by three key sectors including the governor, provincial chief medical officer and provincial hospital director. This provided true information and empowered the Kalasin citizens, including high-risk groups, to participate with COVID-19 prevention and control measures in the province.<sup>8</sup>

The Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation (PRECEDE) behavioral model states that being healthy and/or having healthy behaviors results from predisposing factors including knowledge, attitudes, beliefs, values, and perceptions. Media perception, a crucial health communication method, is very important to develop knowledge and health protection skills of people, especially during the recent COVID-19 pandemic.<sup>9</sup> Reinforcing factors help support the desired health behaviors, such as warning, praise, and encouragement.<sup>10</sup> Finally, enabling factors, skills or physical factors such as availability and accessibility of resources, or services that facilitate the correct health behaviors.

Worldwide, there have been many surveys on behaviors towards prevention of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). One study revealed that a threat and coping appraisal and intention were associated with preventive behaviors towards COVID-19, while another showed that older age (40 years old and over) and higher education (holding a diploma degree) were also associated with good practices.<sup>11,12</sup> Other studies found that frequency of watching COVID-19 news media and sources of media influenced risk perception and media perception, and older age and media watching were associated with knowledge.<sup>12,13</sup> However, a large survey in Hubei, China, revealed that knowledge was significantly associated with negative attitudes and preventive practices toward COVID-19.<sup>14</sup> Preventive behaviors have been defined as any activity undertaken by a person who believes himself to be healthy for the purpose of preventing COVID-19. Currently, behavioral intervention studies and exploration of factors associated with preventive behaviors in Thailand are limited. These findings in a local setting could provide support in developing guidelines for effective preventive behaviors towards COVID-19 in Thailand. The objective of this study is therefore to determine the factors associated with preventive behaviors towards COVID-19 among adults living in Kalasin Province, Thailand.

## Methods

### Study Design

This analytic cross-sectional study was conducted during May to June 2020 to examine the predisposing, reinforcing and enabling factors versus preventive behaviors on COVID-19 among adult residents in Kalasin Province.

### Study Setting

Kalasin Province is a rural province located in the central area of the Northeastern part of Thailand. There were 983,550 populations, 18 districts, one provincial hospital, 17 community hospitals and 156 health centers.<sup>15</sup> We purposively selected this province because all COVID-19 patients experienced difficulty in returning to their home communities. Therefore, some social determinants influencing preventive behaviors might be identified and are able to be applied to other similar areas that will be affected by future COVID-19 epidemics.

### Participants and Sample Size

All adult residents aged more than 15 years old were the target population of the study. The sample size was calculated using an equation to approximate the exact population size. We assumed the standard deviation of risk perception to be the same as towards MERS-CoV equaling 1.15 to calculate a sample size of 560, including a 10% increase to account for non-responders.<sup>16</sup>

### Sampling Methods

To select the sample, we systemically selected one family member out of every five households who visited any of the 17 community hospitals, 30 people per hospital and 50 people from the Kalasin Provincial Hospital.

### Data Collection

The questionnaire was developed from the PRECEDE model, media perception and other related studies.<sup>6,9,13,14,17,18</sup> All participants were interviewed face-to-face using a structured questionnaire. There were eight sections: (i) general questions containing 19 items including demographic characteristics, family structure, environmental questions and access to resources, (ii) knowledge of COVID-19, which comprised 10 items including cause of disease, signs and symptoms, incubation periods, and route of transmission, (iii) risk perception, which had 9 items, (iv) severe perception, which had 7 items, (v) benefit perception, which had 7 items, (vi) media perception, which had 22 items including media sources and types and COVID-19 infections news, (vii) attitudes towards COVID-19, which had 17 items including discrimination, effects of disease, feelings on control about government measures, disadvantages and advantages of COVID-19 outbreak, and (viii) preventive behaviors towards COVID-19, which had 16 items including hand hygiene, wearing face masks,

social distancing, cleaning, consumption, exercise and media activities. Knowledge questions elicited a “yes/no” response. Perceptions were measured on a four-point Likert scale as “disagree”, “slightly agree”, “moderately agree”, or “strongly agree”. Attitudes were measured as “never”, “sometimes”, “often”, or “usually”.<sup>19</sup>

Average scores for attitudes and preventive behaviors were classified into 3 levels as low (1.0-2.0), moderate (2.1-3.0) or good (3.1-4.0) according to the criteria of Best and Kahn.<sup>20</sup> The questionnaire was validated by three experts and the Cronbach coefficient was 0.90. Data were collected by a researcher and trained local healthcare workers in each district. At least one meter of social distancing was maintained during each interview and face masks were worn by all interviewers.

### Statistical Analysis

We used descriptive statistics, frequency and percentage, to describe demographic data, knowledge on COVID-19, risk perception, severe perception, benefit perception, media perception and attitudes. Preventive behaviors were presented by the mean and standard deviations.

We analyzed knowledge, perception, attitude, and behaviors towards COVID-19 by independent t-test and Chi-square test as appropriate. Multiple linear regression analysis was performed using all demographic data, knowledge, risk perception, severe perception, benefit perception, media perception and attitude scores as independent variables and the preventive behavior score as the outcome variable. Predictive factors were determined by backward elimination of non-significant variables. Unstandardized regression coefficients ( $\beta$ ) were used to determine the associations between independent variables and outcomes at the statistical significance level of 0.05. Statistical analysis was conducted using Stata version 13.0.<sup>21</sup>

### Ethical Issues

The study was approved by the research ethical committee of Kalasin Provincial Health Office, Thailand MOPH (KLS.REC53/2563). All participants gave verbal consent before they were interviewed.

## Results

### Socio-demographic Data

Of the 556 participants in the study, 341 (61.3%) were female and the age range was 15-70 years old (mean 37.9, SD 11.7). More than half (52.9%) were married.

Bachelor degree was achieved by 226 (40.7%) participants while 155 (27.9%) had completed high school. Government officer was the most common occupation (33.5%) while incomes were generally uniformly spread between 5,000 baht and 25,000 baht per month. Most participants reported no underlying disease (82.7%), no alcohol consumption (84.9%), and no history of smoking (89.9%). Family members ranged from 1–10 people, including children aged less than 5 years old (52.7%) and elders aged older than 60 years old (59.5%) (Table 1).

**Table 1. Demographic and family data among adult residents living in Kalasin Province, Thailand, 2020 (n=556)**

Characteristics	n	Percentage
<b>General information</b>		
Gender		
Male	215	38.7
Female	341	61.3
Age (years)		
15-25	79	14.2
26-35	185	33.3
36-45	130	23.4
46-55	117	21.0
56-65	42	7.6
>65	3	0.5
(Mean 37.9 , SD 11.7, Range 15 - 70)		
Marital status		
Single	223	40.1
Married	294	52.9
Divorced	39	7.0
Education		
Uneducated	3	0.5
Elementary school	70	12.6
High school	155	27.9
Diploma degree	67	12.1
Bachelor degree	226	40.7
Higher than bachelor degree	35	6.3
Occupation		
Student	12	2.2
Contractor	47	8.5
Agriculturist	67	12.1
Business owners	42	7.6
Private company employee	73	13.1
Government officers	186	33.5
Others	129	23.2

**Table 1. Demographic and family data among adult residents living in Kalasin Province, Thailand, 2020 (n=556) (Con't)**

Characteristics	n	Percentage
<b>General information</b>		
Income (Baht per month)		
<5,000	54	9.7
5,001–10,000	128	23.0
10,001–15,000	106	19.1
15,001–20,000	82	14.8
20,001–25,000	58	10.4
≥25,000	128	23.0
Underlying disease		
No	460	82.7
Yes	96	17.3
Alcohol consumption		
No	472	84.9
Yes	84	15.1
Tobacco consumption		
No	500	89.9
Yes	56	10.1
<b>Family information</b>		
Number of family member		
<5 people	449	80.8
≥5 people	107	19.2
(Mean 4.4 , SD 1.49, Range 1-10)		
Have children age <5 years old in household		
No	263	47.3
Yes	293	52.7
Have elders age >60 years old in household		
No	225	40.5
Yes	331	59.5

### Characteristics of Households and COVID-19 Resource Accessibility

In households, most participants (87.8%) slept in separate bedrooms, ensured good air-circulation (95.7%), and about half (48.7%) used air-conditioners. Most people could access to face masks for their family (89.9%) and soap or alcohol gel for hand washing (88.1%).

### Knowledge and Perception

The overall average scores of knowledge, risk perception, severe perception, benefit perception, media perception, attitudes, and preventive behaviors

towards COVID-19 were in the good level except knowledge on COVID-19 was in a moderate level, especially for the understanding that the cured patients can transmit the SARS-CoV-2 to others was in low level (52.3%) (Table 2).

### Media Perception

The most common sources of media during the outbreak were family members (98.8%), followed by colleagues (98.4%), public health officers (97.7%) and the daily mass media release from the CCSA, Kalasin Province (97.7%) (Figure 1). The favorite media types were mobile phone or tablets (98.7%), television (96.8%), Facebook (94.2%) and LINE application (91.4%) (Figure 2).

### Attitudes

Most of the attitude's questions were scored as 'Good'. Two were scored as 'Moderate': some respondents felt that 14 days of self-quarantine was too long and felt insecure when the government established a quarantine place close to their households. The participants agreed that social distancing, lock down, and wearing face masks could prevent a COVID-19 outbreak and they were satisfied with the national and provincial control measures (Table 3).

### Preventive Behaviors and Associated Factors

Most of the preventive behaviors scores were also scored as 'Good'. Two were scored as 'Moderate': eating and sharing sticky rice with bare hands and having meals with colleagues. The participants cleaned their hands with soap or alcohol gel every day (81.3%) and wore face masks when they were outdoors (89.2%) (Table 4 and 5).

The average score of preventive behaviors towards COVID-19 were statistically different for education, occupation, income, alcohol consumption, and using an air-conditioner in the household ( $p < 0.01$ ) (Table 6).

Multiple linear regression analysis showed that income ( $\beta$  0.10,  $p$  0.003), risk perception ( $\beta$  0.20,  $p < 0.001$ ), media perception ( $\beta$  0.41,  $p < 0.001$ ), and good attitudes on COVID-19 ( $\beta$  0.24,  $p < 0.001$ ) were positively associated with good preventive behaviors towards COVID-19 ( $R^2$  0.39) (Table 7).

### Discussion

This is the first study using the PRECEDE model on COVID-19 in the rural province of Thailand. We found that factors associated with preventive behaviors towards COVID-19 were income, risk perception, media perception, and attitudes.

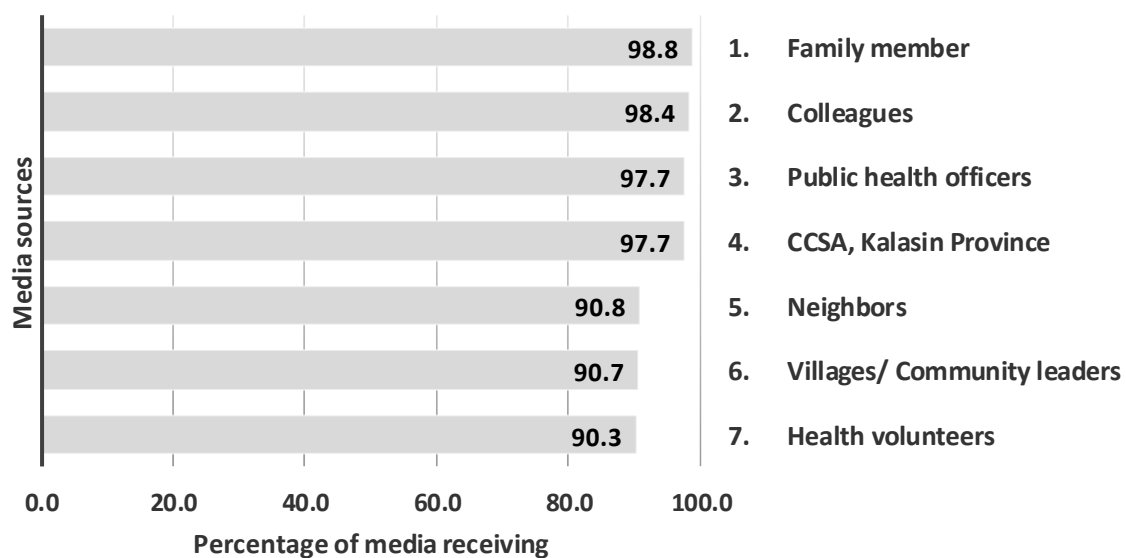
**Table 2. Levels of knowledge, perceptions, attitudes, and preventive behaviors toward COVID-19 among adult residents in Kalasin Province, Thailand, 2020 (n=556)**

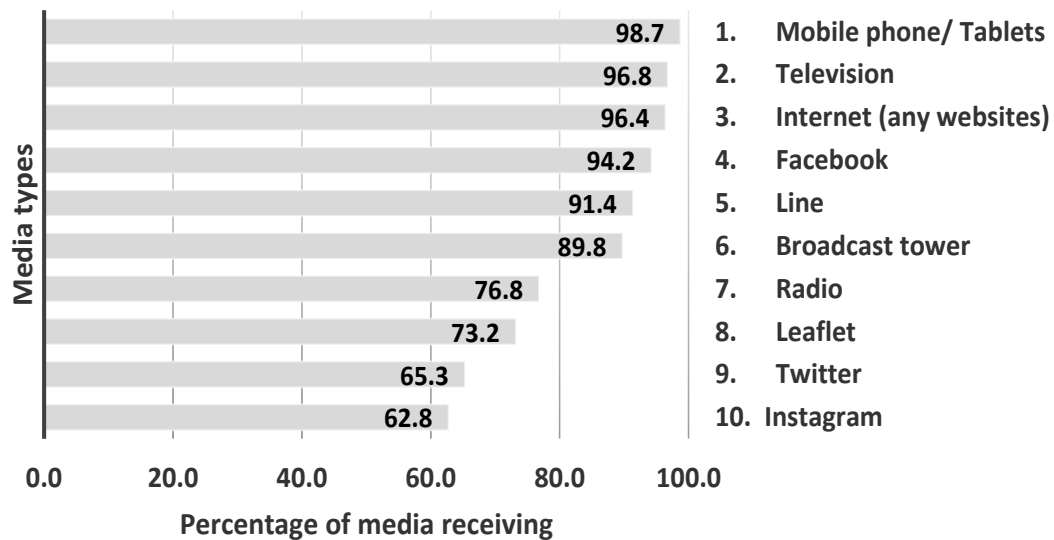
Variables	Range of scores		n (%)	Mean (SD)	Level
	Possible	Actual			
Independent variables					
Knowledge	0.0-10.0	3.0-10.0	314 (56.5)	7.8 (1.12)	Moderate
Risk perception	1.0-4.0	1.9-4.0	439 (79.0)	3.4 (0.39)	Good
Severe perception	1.0-4.0	2.0-4.0	427 (76.8)	3.3 (0.47)	Good
Benefit perception	1.0-4.0	1.1-4.0	442 (79.5)	3.4 (0.39)	Good
Media perception	0.0-3.0	1.0-3.0	284 (51.1)	2.5 (0.56)	Good
Attitude	1.0-4.0	2.2-4.0	463 (83.3)	3.4 (0.35)	Good
Dependent variable					
Preventive behavior	1.0-4.0	1.63-4.0	467 (84.0)	3.4 (0.39)	Good

Knowledge, age, severe perceptions, and benefit perceptions were not associated with preventive behaviors toward COVID-19. These findings are important for developing policies, guidelines, and programs to effectively combat COVID-19. The preventive behaviors that were at a moderate level were eating sticky rice with bare hands and having meals with colleagues at work. This is due to the culture of people in the Northeastern part of Thailand and showed a close relationship with family members, friends, and colleagues. Moreover, as people in rural communities became elderly in the same trend of Thailand that has to adjust to be senior society, more and more elderly people were left in the rural areas.<sup>22</sup> The elderly may have difficulty accessing hand sanitizers or may simply forget to wash their hands. Thus, caregivers should remind them to wash their

hands, especially before eating or after touching dirty equipment or surfaces and provide them with hand-washing facilities that are easily accessible.

Adequate income is an enabling factor of the PRECEDE model that allows people to comfortably or easily access resources that may influence their health behaviors.<sup>17</sup> In this study, income was one of the factors associated with preventive behaviors towards COVID-19. A study by Abdelhafiz et al recommended that salaries should be provided during business closures.<sup>23</sup> People with higher incomes can easily access protective equipment such as face masks, alcohol-based gel and liquid hand soap, and other disinfectants, in addition to receiving knowledge. The COVID-19 outbreak led the Kalasin government to issue related control measures such as a mandate

**Figure 1. Percentage of media sources received during COVID-19 outbreak in Kalasin Province, Thailand, 2020 (n=556)**



**Figure 2. Percentage of media types received during the COVID-19 outbreak in Kalasin Province, Thailand, 2020 (n=556)**

that everyone should wear a face mask outdoors or in crowded areas, and owners of public buildings should prepare alcohol gel for customers to clean their hands before entering the building.

A good level of risk perception about COVID-19 influenced preventive behaviors in this study, similar to the finding of Karasneh et al that risk perception was high among pharmacists in Jordan.<sup>13</sup> In this study, the highest score of risk perception was seen for the statement “Not wearing face masks in the community or crowded area increases the risk of infection (3.9/5)” and “Frequently washing hand with soap or alcohol gel could decrease a chance of infection (3.9/5)”. Other studies revealed that the threat and coping mechanisms motivated COVID-19 preventive behaviors among hospital staff in Iran and more than 87% of Egyptians had concerns about the risk of COVID-19 infection.<sup>11,23</sup>

In this study, although the average score of attitudes was good, negative attitudes were still present. Participants who refrained from travelling or stayed at home during the outbreak felt uncomfortable or stressful (2.9/5) and felt insecure when the government established a quarantine place close to their houses (2.4/5). These attitudes led to social stigmatization, an uncomfortable feeling about the government’s quarantine location. One confirmed case was refused to return to his community by a neighbor and was forced to live with a relative in another province.

COVID-19 is a novel disease and there is limited information on its incubation period, route of transmission and immunity.<sup>1</sup> Fake news and false

knowledge were found in Thai society during the COVID-19 outbreak and it produced various types of media backlash.<sup>6</sup> Positive effects of media included early detection, isolation and treatment that could lead to preventive behaviors. For example, Karasneh et al revealed that frequency of watching media and source of information influenced both risk perceptions and media roles among pharmacists.<sup>13</sup> As Thailand was the first country outside China to report a confirmed case of COVID-19, Thai society was alert and interested in reading any news reported by all types of media, whether it was based on facts or otherwise.<sup>6</sup> Dissemination of misleading information led to negative effects; such as rumors, false knowledge, fear, disguised history of exposure with risk groups of COVID-19, and social stigma.<sup>6</sup> These negative effects caused panic in society rather than raising people’s awareness of practices to prevent further infection in the community.<sup>24</sup> Nowadays, everyone consumes various forms of media. People can exchange both positive and negative information on COVID-19 via multiple types of social media. Therefore, the mass media and social media perceptions greatly affect the way people deal with the response to the COVID-19 pandemic.<sup>25,26</sup>

Knowledge was not associated with preventive behaviors. This result is in contrast with a study among Chinese residents in Hubei where knowledge was significantly associated with attitudes and preventive practice towards COVID-19.<sup>14</sup> Kebede et al revealed that knowledge could predict hand washing and avoidance of hand shaking.<sup>18</sup>

Age, severe and benefit perceptions on COVID-19 were not associated with preventive behaviors toward

**Table 3. Attitudes towards COVID-19 among adult residents in Kalasin Province, Thailand, 2020, classified by question items (n=556)**

Attitude towards COVID-19	Level of attitudes towards COVID-19				Mean (SD)	Level
	Strongly agree	Moderately agree	Slightly agree	Disagree		
	n (%)	n (%)	n (%)	n (%)		
1. Feel 14 days self-quarantine is too long	85 (15.3)	109 (19.6)	114 (20.5)	248 (44.6)	2.9 (1.12)	Moderate
2. Satisfy that government asked to stay at home to reduce infection	342 (61.5)	160 (28.8)	37 (6.7)	17 (3.1)	3.5 (0.75)	Good
3. Feel unsafe due to government set quarantine place near your residence area	143 (25.7)	185 (33.3)	105 (18.9)	123 (22.1)	2.4 (1.09)	Moderate
4. Satisfy with government and provincial outbreak control measures	304 (54.7)	193 (34.7)	43 (7.7)	16 (2.9)	3.4 (0.76)	Good
5. Think that Thailand and Kalasin Province can control COVID-19 outbreak	401 (72.1)	130 (23.4)	19 (3.4)	6 (1.1)	3.7 (0.60)	Good
6. Wear mask can prevent COVID-19	350 (62.9)	174 (31.3)	25 (4.5)	7 (1.3)	3.6 (0.64)	Good
7. Good hand hygiene can prevent COVID-19	384 (69.1)	150 (26.9)	17 (3.1)	5 (0.9)	3.6 (0.59)	Good
8. Social distancing can prevent COVID-19	395 (71.0)	137 (24.6)	19 (3.4)	5 (1.0)	3.7 (0.59)	Good
9. Clean surfaces frequently can prevent COVID-19	368 (66.2)	156 (28.1)	31 (5.6)	1 (0.2)	3.6 (0.60)	Good
10. City lock down can prevent COVID-19	360 (64.7)	145 (26.1)	35 (6.3)	16 (2.9)	3.5 (0.74)	Good

COVID-19. In contrast to our study, Olum et al reported that age more than 40 years old and holding a diploma degree were associated with good practices towards COVID-19.<sup>12</sup> However, in another study, older age was negatively associated with hand washing and avoidance of shaking hands in greetings,

that could lead older aged people to not practice some preventative behaviors.<sup>18</sup> The lack of association for severe and benefit perceptions could be because COVID-19 is a novel disease. Although a number of preventive behaviors, including social distancing, wearing face masks, and hand hygiene have been

**Table 4. Level of preventive behaviors towards COVID-19 among adult residents in Kalasin Province, Thailand, 2020 (n=556)**

Level	Range of mean	Preventive behaviors n (%)
Good	3.1-4.0	467 (84.0%)
Moderate	2.1-3.0	84 (15.1%)
Low	1.0-2.0	5 (0.9%)
Overall	Mean 3.4, SD 0.39	

**Table 5. Preventive behaviors towards COVID-19 of adult residents in Kalasin Province, Thailand, 2020, classified by question items (n=556)**

Preventive behaviors towards COVID-19	Frequency of preventive behaviors					Level
	Usually	Often	Sometimes	Never	Mean	
	n (%)	n (%)	n (%)	n (%)	(SD)	
Hand cleaning with soap or alcohol gel	452 (81.3)	84 (15.1)	19 (3.4)	1 (0.2)	3.8 (0.50)	Good
Avoid using unclean hand when touching mouth, nose, or eyes	361 (64.9)	140 (25.2)	46 (8.3)	9 (1.6)	3.5 (0.72)	Good
1-2 meters social distancing when talking with others	359 (64.6)	146 (26.3)	43 (7.7)	8 (1.4)	3.5 (0.70)	Good
Cleaning frequently touched surfaces such as doorknobs	339 (61.0)	142 (25.5)	61 (11.0)	14 (2.5)	3.4 (0.79)	Good
Wearing a face mask outside at all times	496 (89.2)	47 (8.5)	11 (1.9)	2 (0.4)	3.9 (0.42)	Good
Avoiding leaving home to high-risk areas	406 (73.0)	115 (20.7)	26 (4.7)	9 (1.6)	3.7 (0.65)	Good
Eating fresh or cooked food and use a personal spoon	428 (77.0)	98 (17.6)	27 (4.9)	3 (0.5)	3.7 (0.58)	Good
Eating sticky rice with bare hands	65 (11.7)	118 (21.2)	171 (30.8)	202 (36.3)	2.1 (1.02)	Moderate
Having meals with colleagues	78 (14.0)	176 (31.7)	147 (26.4)	155 (27.9)	2.3 (1.03)	Moderate
Separate personal belongings from family members and colleagues	298 (53.6)	141 (25.4)	84 (15.1)	33 (5.9)	3.3 (0.92)	Good

**Table 6. Comparison of attitude and preventive behavior scores by demographic and family variables towards COVID-19 among adult residents in Kalasin Province, Thailand, (n=556)**

Characteristics	n (%)	Preventive behaviors		
		Mean	SD	t/F
Gender				0.052
Male	215 (38.7)	3.4	0.40	
Female	341 (61.3)	3.4	0.39	
Age (year)				0.560
15-25	79 (14.2)	3.4	0.40	
26-59	462 (83.1)	3.4	0.39	
≥60	15 (2.7)	3.4	0.35	
Marital status				0.705
Single	223 (40.1)	3.4	0.39	
Married	294 (52.9)	3.4	0.39	
Divorced	39 (7.0)	3.4	0.41	
Education				<0.001**
Lower than bachelor degree	295 (53.1)	3.4	0.41	
Bachelor degree and over	261 (46.9)	3.5	0.36	
Occupation				<0.001**
General populations	370 (66.5)	3.4	0.41	
Government employee	186 (33.5)	3.5	0.35	
Income (Baht per month)				<0.001**
≤15,000 (\$500)	288 (51.8)	3.3	0.41	
>15,000 (\$500)	268 (48.2)	3.5	0.36	

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.05$  (Bonferroni)



**Table 6. Comparison of attitude and preventive behavior scores by demographic and family variables towards COVID-19 among adult residents in Kalasin Province, Thailand, (n=556) (Con't)**

Characteristics	n (%)	Preventive behaviors		
		Mean	SD	t/F
Underlying disease				0.810
No	460 (82.7)	3.4	0.40	
Yes	96 (17.3)	3.4	0.40	
Alcohol consumption				0.008**
No	472 (84.9)	3.4	0.38	
Yes	84 (15.1)	3.3	0.43	
Tobacco consumption				0.098
No	500 (89.9)	3.4	0.37	
Yes	56 (10.1)	3.3	0.52	
Have children age less than 5-years old in family				0.925
No	263 (47.3)	3.4	0.40	
Yes	293 (52.7)	3.4	0.39	
Have elders age more than 60 years old in family				0.333
No	225 (40.5)	3.4	0.39	
Yes	331 (59.5)	3.4	0.39	
Separated bedroom in household				0.402
No	68 (12.2)	3.4	0.39	
Yes	488 (87.8)	3.4	0.39	
Air circulation in household				0.412
Not good	24 (4.3)	3.5	0.36	
Good	532 (95.7)	3.4	0.39	
Used an air-conditioner in household				0.004*
No	271 (48.7)	3.4	0.42	
Yes	285 (51.3)	3.5	0.36	
Have sufficient face mask for family				0.056
No	56 (10.1)	3.3	0.46	
Yes	500 (89.9)	3.4	0.38	
Ever received alcohol gel and face mask from government agencies				0.002*
No	136 (24.5)	3.3	0.47	
Yes	420 (75.5)	3.4	0.36	
Have enough soap or alcohol gel for hand washing				0.833
No	66 (11.9)	3.4	0.40	
Yes	490 (88.1)	3.4	0.39	

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.05$  (Bonferroni)

suggested, it was not known how protective these measures were, leading to self-protection concerns resulting in negative social and mental effects.<sup>6</sup>

There were some limitations in this study. First was the lack of diversity in the study sample with one third of participants being government officers. This was somewhat unavoidable since general people feared about being infected with COVID-19 and

stayed at home during the lock down measure, thus the majority of people visiting our study hospitals were government officers who had been allowed to work outside. Second, as there were no standardized tools to determine attitudes and preventive behaviors towards COVID-19 in Thailand, the questionnaire and measurement tools were developed based on literature review, the PRECEDE model, and media

**Table 7. Factors associated with preventive behaviors towards COVID-19 among adult residents in Kalasin Province, Thailand, 2020 (n=556)**

Variables	b	SE (b)	Beta	t	p
Income	0.08	0.03	0.10	3.01	0.003
Risk perception on COVID-19	0.21	0.04	0.20	5.71	<0.001
Media perception on COVID-19	0.32	0.03	0.41	11.84	<0.001
Attitudes towards COVID-19	0.26	0.04	0.24	6.36	<0.001
Constant = 1.13		0.15	-	7.44	<0.001
R <sup>2</sup> 0.39, F <sub>(4, 551)</sub> 88.17, p<0.001					

perception theories and the reliability and validity might have limitations. Third, this study was purposively conducted in Kalasin Province, a small the province in Northeastern Thailand with its own unique ethnic group and culture; therefore, participants may not be representative of all residents of Thailand. Therefore, factors associated with attitudes and preventive behaviors towards COVID-19 found in this study may not be generalizable to other parts of Thailand.

### Conclusion

Income, risk perception, attitudes, and media perception could predict preventive behaviors towards COVID-19. Therefore, these findings are important for developing effective policy and health promotion programs, especially to combat the negative attitude towards those affected by COVID-19. Face masks and alcohol gel should be provided equally for effective prevention of COVID 19. Accurate and trustworthy information about COVID-19 should be broadcast throughout communities to ensure supportive perceptions, attitudes, and preventive behaviors towards COVID-19.

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