Predicting COVID-19 Preventive Behaviors based on Protection Motivation Theory in Hormozgan, Iran

Roghayeh Ezati Rad
Hormozgan University of Medical Sciences School of Health https://orcid.org/0000-0003-3139-2417
Shokrollah Mohseni
Hormozgan University of Medical Sciences
Hesamaddin Kamalzadeh Takhti
Hormozgan University of Medical Sciences Faculty of Medicine
Mehdi Hassani Azad
Hormozgan University of Medical Sciences
Nahid Shahabi
Hormozgan University of Medical Sciences
Teamur Aghamolaei (teaghamolaei@gmail.com)
Hormozgan University of Medical Sciences https://orcid.org/0000-0002-2504-8014
Fatemeh Norozian
Hormozgan University of Medical Sciences

Research article

Keywords: protection motivation theory, coping appraisals, threat appraisals, SARS, Coronavirus

Posted Date: September 25th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-51301/v1

Version of Record: A version of this preprint was published on March 8th, 2021. See the published version at https://doi.org/10.1186/s12889-021-10500-w.

Abstract

Background: The present research aimed to predict the preventive behaviors of COVID-19 in the light of the Protection Motivation Theory (PMT).

Methods: The present cross-sectional research was conducted in 2 months (March 2020-April 2020) in Hormozgan Province of Iran. The research population comprised all residents above 15 years of age. They received an online questionnaire survey in two parts, demographic information along with PMT constructs. To analyze the data, independent t-test and one-way anova test, Multiple linear regression and the statistical technique of path analysis and structural equation modeling was used. All statistical calculations and hypothesis testing were performed using spss21 and Amos21 software and a significant level of hypothesis testing was considered to be 0.05

Results: A total number of 2,032 subjects participated in this research, the mean age of whom was 34.84±9.8 (R=15-98). The majority of participants were between 31 - 40 years old, female (60.4%), married (72%), urban residents (87.3%), holding a Bachelor's degree or higher (58.8%) and employed (58.8%). Statistically significant positive correlation coefficients were estimated between preventive behaviors of COVID-19 and perceived vulnerability (r=0.192, p<0.001), perceived severity (r=0.092, p<0.001), response efficacy (r=0.398, p<0.001) ,self efficacy (r=0.497, p<0.001) and protection motivation (r=0.595, p<0.001). Statistically significant negative correlations were found between behavior and maladaptive behavior rewards (r=-0.243, p<0.001) and perceived costs (r=-0.121, p<0.001).

Conclusions: The present findings showed that maladaptive behavior reward and fear predicted protective behaviors negatively; response efficacy and self-efficacy predicted protective behaviors positively. The effect of self-efficacy was the strongest among all. The information provided in this research can contribute to policy-making in the country.

Background:

Today, the prevalence of infectious diseases is considered a global issue (1) .Respiratory diseases are widespread and epidemic and account for a high rate of mortality in communities(2) .

In December 2019, a new Coronavirus named as nCoV-2019 appeared as pneumonia pandemic in Wuhan (originating from sea food markets) and soon spread in whole China(3). On January 30, 2020, the pandemic of the new Coronavirus was announced by the World Health Organization (WHO) as a public medical emergency(4–7). COVID-19 is a serious infectious respiratory disease and is currently considered the most fatal threat to human population. This disease has infected large populations so far and has accounted for many mortalities(8).

The most frequent symptoms of the disease include fever, dry coughs and fatigue(9, 10) Fortunately, this disease can be prevented by taking good care of health. Preventive measures exemplified by WHO were avoiding close contact with the afflicted, washing hands recurrently and avoiding unprotected contacts with domestic or wild animals. Moreover, those with the symptoms of acute respiratory infection should take certain protective measures (e.g. keeping a 1-2-meter distance, covering face while coughing or sneezing with tissue-paper or cloth, washing hands recurrently and not touching the mouth, nose and eyes. Moreover, stress and anxiety management can help prevent the disease (8, 11).

Until July 28, 2020, global statistics of COVID-19 show that a total number of 215countries from all continents are afflicted. Iran ranks eleventh among all. The total number of afflicts at a global scale exceeds 16899316. The mortality rate is 663540 cases. In Iran, 296273 people are afflicted while 16,147 people died. In Hormozgan, these are, respectively, 19,934 and 516 cases (12).

In Iran, On February 19, 2020, two patients were diagnosed with COVID-19 in Qom city. Afterwards, the disease quickly spread to the neighboring provinces including Tehran, Markazi, Isfahan and Semnan. Soon, the disease was spread to 31 provinces (11).

As this disease is truly contagious, it is rapidly widespread and it afflicts so many people; the adverse effects are severe especially the acute respiratory syndrome and the mortalities induced; no definite cure or vaccine has ever been developed; thus, protective measures seem to be essential(8, 9).

Healthy behavior theories can help better perceive the effective factors involved in protective behaviors to plan for health promotion. The Protection Motivation Theory (PMT) was introduced by Rogers (1975) and has been widely used as a framework to predict protective behaviors(13).

PMT assumes that adopting a protective behavior recommended against health threats is a direct act of personal motivation for self-protection. In PMT, fear is appraised to predict and encourage people to adopt protective behaviors and explain the intermediary cognitive processes for threat appraisal and coping appraisal(14).

Threat and coping appraisals can lead to the intention of adaptive response (as a protective motivation) or can lead to maladaptive responses, which are threats to one's health (15).

In PMT, threat appraisal depends on: 1. one's belief in the severity of the problem (perceived severity) 2. one's estimation of the chances of being infected with the disease (perceived vulnerability) 3. one's belief in the positive aspects of unhealthy behavior (perceived rewards). Thus, if perceived severity and vulnerability are high and perceived rewards is low, there is a stronger motivation for engagement in health promoting behaviors. In PMT, coping appraisal includes: 1. one's evaluation of the extent to which the protective behavior is effective in coping with the threat (response efficacy) 2. one's belief in one's own capability of managing protective behaviors (self-efficacy) 3. one's estimation of any cost including money, time, energy and efforts spent on showing protective behaviors (perceived response cost).

Response efficacy and self-efficacy are expected to reinforce coping appraisal. To the contrary, response cost is expected to lower it (Fig. 1) (16)

Fear is a moderating variable between perceived vulnerability, severity and threat appraisal. Thus, if one feels vulnerable to a serious health threat, the level of fear is increased and one is further motivated to adopt a preventive/protective behavior. These two appraisal processes are integrated to form protection motivation (17).

A body of related research shows that PMT is very well capable of predicting the adoption or non-adoption of protective behaviors(2, 18, 19).

PMT has been used to investigate behaviors such as the reception of influenza vaccine(20), preventive behaviors of H1N1 pandemic (2) ,cancer preventive behaviors and sun-safe behavior (21, 22) SARS preventive behaviors (23) and preventive behaviors for infectious diseases and skin cancer preventive behaviors(24–26). Yet, this theory has not been employed to explore protective behaviors of COVID-19 in Hormozgan Province population.

Methods:

Research Design:

The present cross-sectional research was conducted within a period of 2 months (March 2010 to April 2020) in Hormozgan Province. The target population comprised residents of Hormozgan Province aged above 15 years. Hormozgan is located in a Southern province in Iran located on Persian Gulf coastline. This province includes 13 counties. The population of this province, according to the census in 2017 was estimated at 177641500.

This research was approved by the ethics committee of Hormozgan University of medical sciences (ID#980470, Ethical#IR.HUMS.REC.1398.479).

Filling out the questionnaire survey was voluntary. On the first page of the survey, the voluntary participation of the respondents was appreciated.

Data Collection:

To avoid the probability of transmitting the disease through paper-and-pencil surveys, online survey was preferred. The link of the survey was shared via social networks or emails with participants and they were kindly requested to respond to the questions.

Inclusion criteria were the minimum age of 15, literacy and residence in Hormozgan Province. The exclusion criterion was unwillingness to participate. The data collection instrument was a researcher-made questionnaire, the content validity of which was tested and approved.

The content of the questionnaire was derived from credible sources including relevant books and academic papers, and it was approved by a panel of 3 experts (health education and promotion specialists) the required changes were both qualitatively and quantitatively made. The former involved asking experts to rate items in terms of the words chosen, the order of presentation and appropriate scoring. They provided the feedback and the corrections were made accordingly.

The reliability of the questionnaire was checked through Cronbach's alpha test and was approved. The questionnaire consisted of two parts, the first of which addressed demographic information (i.e. age, gender, marital status, education, occupation, background disease, history of smoking tobacco). The second part dealt with the PMT constructs. All constructs of PMT except for behavior were rated on a 5-point Likert scale (1 to 5) ranging from strongly agree to strongly disagree. The behavior construct was rated on a 5-point scale (0-4) ranging from never to always.

Perceived vulnerability (e.g. "I may also get afflicted with Coronavirus.") was tested with 4 items and a score ranging from 4 to 20. Perceived severity (e.g. "If afflicted with Coronavirus, there are chances of early death.") was tested with 6 items and a score ranging from 6 to 30. Perceived reward of maladaptive behavior (e.g. "It is easier to breathe without a mask.") was tested with 7 items and a score ranging from 7 to 35. Perceived response efficacy (e.g. "Recurrent washing of hands with water and soap for at least 20 seconds can protect me against Coronavirus.") was tested with 7 items and a score ranging from 7 to 35. Perceived self-efficacy (e.g. "I can adequately and appropriately disinfect contaminated or suspicious things and areas.") was tested with 6 items and a score ranging from 6 to 3o. Perceived response cost (e.g. "Disinfecting contaminated things and areas is time-consuming.") was tested with 7 items and a score ranging from 7 to 35. Fear (e.g. "When I think about Coronavirus, I feel anxious.") was tested with 6 items and a score ranging from 6 to 30. Protection motivation (e.g. "I have decided not to travel until the disease is over.") was tested with 7 items and a score ranging from 7 to 35. Finally, behavior (e.g. "I avoid kissing or shaking hands with others.") was tested with 10 items and a score ranging from 0 to 40.

Data Analysis:

Frequency, percentage, average and standard deviation indices will be used to describe the data. To test the hypotheses and explore the correlation of COVID-19 preventive behaviors and the demographic variables, T-test and one-way ANOVA test were used. To test the correlation between the protection motivation theory constructs and preventive behaviors, multivariate linear regression analysis was used. Moreover, to test the interaction of constructs within the model and accept/reject the conceptual model of COVID-19 preventive behaviors, path analysis and structural equation modeling were used. All statistical analyses and hypothesis testing was done in SPSS21 and AMOS21. The significance level was set at 0.05.

Results:

Research Sample:

In the present research, 2,219 participants were included who received and filled out the questionnaires online. However, 3.9% (n = 87) of the questionnaires were incomplete and thus discarded. Finally, 2,032 questionnaires were analyzed. The average age of the participants was 34.84 ± 9.8 years, ranging from 15 to 98 years. The majority of participants were 31–40 years old, female (60.4%), married (72%), urban residents (87.3%), holding a Bachelor's degree or higher (58.8%) and employed (58.8%). 17.4% were health staff. 7.6% had hypertension, 3.9 diabetes, 5% renal disease and 3.5% cardiovascular disease. 10.7% were tobacco smokers.

As the results showed, the mean score of protective behaviors was significantly higher among participants who were above 15 years of age, female, married, holding a Bachelor's degree or higher, employed, health staff, urban residents and non-smokers. The demographic information of the participants and the mean scores of their protective behaviors are summarized in Table 1.(Table 1)

Table 1
Research participants' demographic information

Demographic information	catrgory	Frequency N(%)	Covid preventive behaviors Score Mean(SD)	pvalue
AGE	15–20 year	132(6.5)	31.70 (5.961)	< .001
	21–30 year	549(27)	34.39 (5.331)	
	31–40 year	862(42.4)	35.83 (4.109)	
	41–50 year	363(17.9)	36(4.218)	
	> 50 year	126(6.2)	36.44 (3.928)	
Gender	Male	804(39.6)	34.88(4.748)	.005
	Female	1228(60.4)	35.48(4.742)	
Marital status	Single	510(25.1)	34.04(5.360)	< .001
	Married	1464(72)	35.64(4.367)	
	Divorced / widowed	58(2.9)		
Highest level of education	Elementary	36(1.8)	33.57(5.320)	< .001
	High school	138(6.8)		
	Diploma	442(21.8)	34.21(5.394)	
	Associate Degree	222(10.9)	34.74(4.761)	
	Bachelor's degree and higher	1194(58.8)	35.96(4.246)	
Job	Student	73(3.6)	32.98 (5.586)	< .001
	University student	107(5.3)		
	Employee	934(46)	35.91 (4.416)	
	Self-employed	252(12.4)	34.31 (5.219)	
	Unemployed	255(12.5)		
	Others	411(20.2)	35.87 (3.943)	
Medical staff	yes	354(17.4)	36.21 (4.704)	< .001
	no	1678(82.6)	35.04 (4.739)	
Chronic diseases	hypertension	154(7.6)	36.06 (3.995)	0.025
	Diabetes	79(3.9)	34.73 (4.830)	0.334
	kidney disease	101(5)	34.46 (4.916)	0.089
	Cardiovascular disease	71(3.5)	35.30 (4.083)	0.921
Smoking	yes	217(10.7)	34.24 (4.781)	0.001
	no	1815(89.3)	35.36 (4.736)	
Place of residence	Urban	1773(87.3)	35.4 (4.593)	< .001
	Rural	259(12.7)	34.16 (5.617)	

Table 2 includes Cronbach's alpha and the range of scores for PMT constructs. The crude mean scores, adjusted mean scores, percentages as well as Pearson correlation coefficients of PMT constructs are included concerning the target protective behaviors.

Table 2
Bivariate Correlations of PMT Variables and protective behaviors of COVID-19

Variable	Item Number	α	Range of score	Mean(SD) crud	Mean(SD) adiusted	mean percentage	1	2	3	4	5	6	7
Vulnerability	4	0.773	4–20	16.11(2.37)	4.03(.594)	80.570		0.321**	-0.180**	0.284**	0.172**	-0.009	0.086**
.Severity	6	0.765	6–30	21.69(3.66)	3.62(.610)	72.306			-0.200**	0.198**	0.042	0.035	0.035
Rewards	7	0.793	7–35	15.29(4.89)	2.18(.699)	43.676				-0.321**	-0.215**	0.422**	0.104**
Response efficacy	7	0.789	7–35	29.77(3.66)	4.25(.523)	85.049					0.484**	-0.159**	0.044
Self-efficacy	6	0.782	6–30	25.31(3.45)	4.22(.576)	84.381						-0.188**	-0.021
Costs	7	0.751	7–35	21.88(4.41)	3.13(.630)	62.512							0.321**
Fear	6	0.917	6–30	21.20(5.45)	3.53(.908)	70.666							
Motivation	7	0.896	7–35	32.17(3.50)	4.60(.500)	91.924							
9.Covid preventive behaviors	10	0.850	0–40	35.24 (4.75)	3.52(.475)	88.101							

In the present research, statistically significant positive correlation coefficients were estimated between preventive behaviors of the disease and perceived vulnerability ($r = 0.192$, $p < 0.001$), perceived severity ($r = 0.092$, $p < 0.001$), response efficacy ($r = 0.398$, $p < 0.001$) ,self efficacy ($r = 0.497$, $p < 0.001$) and protection motivation ($r = 0.595$, $p < 0.001$). Statistically significant negative correlations were found between behavior and maladaptive behavior rewards ($r=-0.243$, $p < 0.001$) and perceived costs ($r=-0.121$, $p < 0.001$). (Table 2)

Table 3 and Fig. 2 show the results of path analysis and SEM (structural equation modeling). Overall, the structural equations show that 35% of variance in the dependent variable (COVID-19 preventive behaviours) is explained by the independent variable (motivation) ($R2 = 0.348$).

Table 3
Path Analysis of PMT Covid Prevention Model (n = 2032)

Dependent Variable	Independent Variables	Path Confidence	t-statistic	R Square
Covid preventive behaviors	Motivation	0.590	32.907	0.348
Motivation	Coping appraisal	0.518	28.538	0.330
	Threat appraisal	0.142	7.792	
	Fear	0.204	11.213	

R2 for protection motivation is .330, which indicates that 33% of variance in the dependent variable (motivation) is explained by the independent variables (coping appraisal, fear and threat appraisal).

Coping appraisal ($\beta = 0.518$ t-statistic = 28.538) and Threat appraisal ($\beta = 0.142$ t-statistic = 7.792) Fear ($\beta = 0.204$ t-statistic = 11.213) showed to be significantly correlated with protection motivation (p-value < 0.001). Moreover, Motivation protection ($\beta = 0.518$ t-statistic = 28.538) was significantly correlated with COVID-19 preventive behaviour (p-value < 0.001).(Table 3 and Fig. 2)

For the regression analysis of constructs, the BACKWARD method was used. As it can be seen in Table 4, maladaptive behavior rewards (Beta = -0.046, P = 0.014), response efficiency (Beta = 0.071, P = 0.001), self-efficacy (Beta = 0.184, P < 0.001) and fear (Beta = -0.078, P < 0.001) predicted protective behaviors of COVID-19. As the regression analysis results showed, the PMT constructs managed to explain 39% of variance in protective behaviors of the disease. Among the constructs, self-efficacy was the strongest predictor.

Table 4
Predicting covid Prevention Behavior: multiple Regression Analyses (n = 2032)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		R Square
	B	Std. Error	Beta			Lower Bound	Upper Bound	
(Constant)	8.764	1.024		8.561	< .001	6.757	10.772	.398
Rewards	− .044	.018	− .046	-2.454	.014	− .080	− .009	
Response efficacy	.092	.028	.071	3.336	.001	.038	.146	
Self-efficacy	.253	.031	.184	8.176	< .001	.192	.313	
Fear	− .068	.015	− .078	-4.404	< .001	− .098	− .038	
a. Dependent Variable: Covid prevention behaviors								

Two variables, rewards (Beta = − 0.046) and Fear (Beta = − 0.078) showed to be negatively correlated with behaviour. A higher score of these two variables was associated with a lower score of COVID-19 preventive behaviour.(Table 4)

In Table 5, the distribution (frequency and percentage) of protective behaviors reported by the participants are summarized. The results show that 79.8% of the participants always avoid unnecessary travel; 78.6% always avoid kissing or hand-shakes; 74.4% wear masks if they approach a suspicious case of the disease. (Table 5)

Table 5
Distribution of preventive behaviors among research participants

Preventive behavior	Never n(%)	Seldom n(%)	Sometimes n(%)	Mostly n(%)	Always n(%)	Item mean	Item SD
Going out of home only on emergency	27(1.3)	1(0)	488(24)	499(24.6)	1017(50)	3.22	**0.902**
Avoiding kissing or shaking hands	24(1.2)	0(0)	75(3.7)	355(16.5)	1598(78.6)	3.71	**0.648**
Avoiding touching mouth, nose and eyes	10(.5)	0(0)	244(12)	759(37.4)	1019(50)	3.37	**0.729**
Keeping a 1–2 meter social distance	11(.5)	2(.1)	237(11.7)	752(37)	1030(50.7)	3.37	**0.734**
Using tissues while coughing/sneezing	8(.4)	0(0)	130(6.4)	446(21.9)	1448(71.3)	3.64	**0.638**
Avoiding crowded places	32(1.6)	0(0)	132(6.5)	505(24.9)	1363(67.1)	3.56	**0.752**
Washing hands recurrently with water and soap for at least 20 seconds	8(.4)	1(.0)	106(5.2)	529(26)	1388(68.3)	3.62	**0.625**
Avoiding unnecessary travel	63(3.1)	0(0)	97(4.8)	250(12.3)	1622(79.8)	3.66	**0.833**
Stress management	13(.6)	0(.0)	205(10.1)	677(33.3)	1137(56)	3.44	**0.725**
Wearing masks while approaching suspicious cases of COVID-19	11(.5)	0(.0)	141(6.9)	369(18.2)	1511(74.4)	3.66	**0.655**
approaching suspicious cases of COVID-19							

Discussions:

The present research aimed to predict the adoption of COVID-19 preventive behaviors based on the Protection Motivation Theory among Hormozgan residents, those above 15 years of age. The results revealed that maladaptive behavior rewards, response efficacy, self-efficacy and fear predicted the protective behaviors. Among these constructs, self-efficacy was the strongest predictor. The mean score for COVID-19 preventive behaviors in the target population was above the average. This can be due to the adequate awareness-raising and management of the disease. Among preventive behaviors, avoiding unnecessary travel, avoiding kissing/shaking hands and wearing masks showed to be the most prevalent preventive behaviors.

Moreover, the results showed a statistically significant correlation between age and protective behavior of the disease. The higher the age, the higher the frequency of adopting protective behaviors. This can be due to a higher awareness and perceived threat at the higher age. Older people are more prone to background diseases, which can be a reason for more protection too. Perceived severity is dependent on age, and is higher among the elderly than the youth (27).

The present finding is consistent with some similar research about unsafe driving in Yazd (28), which showed that a higher age is associated with more protective behaviors. Yet, the results reported by Lowe et al. among Australian university students showed that a higher age was followed by fewer protective behaviors against sunlight (22). This is divergent from the present finding and the reason can be the different cultures and protective behaviors binvolved. As the results showed, it is essential to plan for the youth's awareness-raising and to encourage them to adopt more protective behaviors.

The overall score showed statistically significant differences for preventive measures and education levels. Those holding a Bachelor's degree or higher adopted more protective behaviors, which can be due to their higher level of knowledge. It is, thus, necessary to plan for making the required interventions to raise the awareness of less educated residents of the province.

The results also showed that women adopted more preventive behaviors than men. Several other studies in other ethnicities also confirmed such differences between male and female in terms of health beliefs and healthy behaviors. These findings show that certain gender-specific plans need to be made to reinforce preventive behaviors for COVID-19.

Pearson's correlation coefficients showed statistically significant positive correlations between preventive behavior and perceived severity, vulnerability, response efficacy, self-efficacy and protection motivation. Significant negative correlations were found between behavior and perceived reward and costs. These are consistent with a number of studies(21, 29).

The present findings also revealed that COVID-19 preventive behavior was significantly and positively correlated with perceived vulnerability. This finding shows that if people perceive themselves vulnerable to the disease, they adopt more protective behaviors. These findings are consistent with the results reported by Babazadeh et al (30) and Mohammadi et al (31).

The present research also found that protective behaviors and perceived severity were positively and significantly correlated. Thus, if people are made aware of the health consequences of the disease, they adopt more protective behaviors. This is in agreement with Tazval et al (32) yet different from Hadi et al (33).

A statistically significant positive correlation was also observed between perceived vulnerability and severity of the disease. This finding is consistent with a number of studies including Barati et al (34)., Zare et al (21) and Park et al(35). These findings show that for a better perception of the risk of affliction with the disease, a higher level of perceived vulnerability is needed, as such a perception can strongly and positively affect the perceived threat of COVID-19.

A statistically significant positive correlation was found between perceived response efficacy of preventive behaviors and self-efficacy and protection motivation. This shows that an increased perception of the effectiveness of protective behaviors is followed by an increased level of self-efficacy, and vice versa. Moreover, an increased perception of the effectiveness of protective behaviors is associated with a higher motivation for protection, and vice versa. This is consistent with Zare Sakhvidi et al.(21).

The present research also showed that COVID-19 preventive behavior was significantly and positively correlated with protection motivation. This finding diverged from that of Kaviani et al.(36).

Variables subsumed under coping appraisals were the strongest predictors of protective behaviors in the target population. Self-efficacy was the strongest predictor of the behavior. Only next was the response efficacy, similar to several other studies(21, 37) .Those enjoying a higher level of self-efficacy perceive themselves capable of making achievements. Thus, they show a tendency to preventive behaviors of the disease. Both response efficacy and self-efficacy are subsumed under coping appraisal in PMT. Response efficacy deals with the fact that the suggested coping response may be effective in lowering threat. Self-efficacy deals with the perceived capability of making a coping response. Regression coefficients of these two constructs show that a higher level of self-efficacy and response efficacy can help increase motivation for preventing COVID-19. These findings are consistent with previous studies which also adopted PMT as their theoretical framework.

Available coping strategies to participants are more effective in the frequency of adopting protective behaviors. High response efficacy strengthens their intention of self-protection and belief in the effectiveness of the protective behavior(38, 39). The effect size of coping variables or threat depends to some extent on the nature of the health issue. In the light of the related literature, threat appraisal variables showed to be the strongest predictor of cancer preventive behaviors. Yet, for smoking, coping appraisals were the strongest predictor of preventive behaviors(29). The high education level of the participants can be part of the reason for this (40). In the present research, the majority of participants were between 31 and 40 years old. This can be the main reason for the unprecedented effect of perceived severity and vulnerability in PMT and preventive behaviors. Higher self-efficacy can improve preventive behaviors in vulnerable population (41, 42). Health promotion programs with the aim of improving self-efficacy in COVID-19 preventive behaviors might improve behaviors and promote health at a social level.

Maladaptive behavior reward and fear were negatively correlated with preventive behaviors. Thus, it can be concluded that the higher the level of fear and maladaptive behavior reward, the lower the probability of adopting protective behaviors. Therefore, awareness of the rewards of maladaptive behaviors is more important than the perceived cost of healthy behaviors. This finding is consistent with the use of condom in some other research(43). However, in an investigation of cancer preventive behaviors at workplace, perceived costs showed to be more important than perceived reward (21).

In the present research, protective behaviors showed to be at a desirable level, which is consistent with some research by Barati et al about COVID-19 protective behaviors among hospital staff (34). Moreover, in the present research among preventive behaviors, avoiding unnecessary travel was found to be the most prevalent protective behavior, which seems to result from limits set by social distancing. Avoiding kissing/shaking hands and wearing masks ranked second and third among protective behaviors. In another study in Saudi Arabia on MERS, hand-wash showed to be the commonest protective behavior along with wearing masks while coughing/sneezing(44). In a study in China, the most prevalent protective behaviors included avoiding crowds, going out less frequently, wearing a mask while going out, and not entering closed and crowded places(45). Considering the fact that COVID-19 is a new-coming disease and has afflicted all countries all over the world, the information sources are constantly being updated and, thus, adopting protective behaviors at an acceptable level is not far-fetched.

As regular washing of hands is the foremost protective behavior, yet is less adopted by the target population, it seems that more extensive awareness-raising and relevant education is of an incomparable importance.

Behavioral change is a process and it takes time to initiate and develop a new behavior. According to the theory adopted in this research, coping appraisal responses that lead to protection motivation are made after the threat appraisal process. That is because a threat needs to be identified before the appraisal

of coping strategies to choose from. Evidently, before things get uncontrollable, attempts should be made to improve public awareness, create mutual trust, promote effective coping responses and contribute to the achievement of plans.

Strengths Of Study:

The present research is among the very few cases of applying health promotion models to explore preventive behaviors of COVID-19. This research was conducted with a large sample and within the shortest time possible.

Limitations Of Study:

Online surveys can be only used by those able to read and write and having access to the net. The majority of participants in this research were young urban residents. Thus, the generalizability of findings is limited.

Conclusion:

The present findings revealed that the reward of maladaptive behaviors and fear were the negative predictors of protective behaviors. Response efficacy and self-efficacy were the positive predictors of protective behaviors. The effect of self-efficacy was the strongest. The participants' score for COVID-19 preventive behaviors was above average. This can be due to adequate awareness-raising and management of the issue. Among preventive behaviors, avoiding unnecessary travel, avoiding kissing/shaking hands and wearing masks were the most prevalent. The present findings can illuminate policy-making in the target population.

Abbreviations

PMT : Protection Motivation Theory

WHO: World Health Organization

SARS: Severe Acute Respiratory Syndrome

H1N1: Influenza Swine Flu

COVID19: COrona VIrus Disease 2019

ANOVA: Analysis Of Variance

SEM: Structural Equation Modeling

Declarations

Ethics approval and consent to participate

The study was approved by the ethics committee of Hormozgan University of Medical Sciences (ethical code: IR.HUMS.REC.1398.479). The ethics committee has approved to conduct the study online and obtain online consent. All participants who provided online consent for the study, were assured that participation was voluntary, they could leave the study at any time, the data were anonymised, securely stored and analyzed for publication. People under 16 years of age have completed the questionnaires with parental consent.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This study received financial support from deputy of Research, Hormozgan University of Medical Sciences (grant no.980470). Study design, data collection and analysis processes were developed independently of the funder.

Authors' contributions

TA contributed to the study design, SHM analyzed data, RER wrote the manuscript AND conducted data collection, NSH and MHA conceived the study, developed the study protocol and questionnaires, and supervised data collection, FN conducted data collection, HKT Design online questionnaire. All authors have read and approved the manuscript.

Acknowledgements

The authors express their gratitude to the deputy of Research, Hormozgan University of Medical Sciences for funding the project.

References

1. Glass LM, Glass RJ. Social contact networks for the spread of pandemic influenza in children and teenagers. BMC public health. 2008;8(1):61.
2. Sharifirad G, Yarmohammadi P, Sharifabad MA, Rahaei Z. Determination of preventive behaviors for pandemic influenza A/H1N1 based on protection motivation theory among female high school students in Isfahan, Iran. Journal of education and health promotion. 2014;3:7.
3. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. New England Journal of Medicine. 2020.
4. Gorbalenya AE. Severe acute respiratory syndrome-related coronavirus–The species and its viruses, a statement of the Coronavirus Study Group. BioRxiv. 2020.
5. Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. Bioscience trends. 2020;14(1):72-3.
6. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. New England Journal of Medicine. 2020.
7. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV) [30 January 2020]. Available from: https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov).
8. Khot WY, Nadkar MY. The 2019 Novel Coronavirus Outbreak–A Global Threat. Journal of The Association of Physicians of India. 2020;68:67.
9. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. JAMA. 2020.
10. Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. Infectious diseases of poverty. 2020;9(1):29.
11. Abdi M. Coronavirus disease 2019 (COVID-19) outbreak in Iran; actions and problems. Infection control and hospital epidemiology. 2020:1-5.
12. [updated March 12, 2020. Available from: https://www.worldometers.info/coronavirus/.
13. Sommestad T, Karlzén H, Hallberg J. A meta-analysis of studies on protection motivation theory and information security behaviour. International Journal of Information Security and Privacy (IJISP). 2015;9(1):26-46.
14. Rogers RW. A protection motivation theory of fear appeals and attitude change1. The journal of psychology. 1975;91(1):93-114.
15. Sadeghi R, Mazloomy Mahmoodabad SS, Fallahzadeh H, Rezaeian M, Bidaki R, Khanjani N. Predictive factors for preventing hookah smoking and health promotion among young people based on the protection motivation theory. Journal of education and health promotion. 2019;8:169.
16. Taheri-Kharameh Z, Bashirian S, Heidarimoghadam R, Poorolajal J, Barati M, Rásky É. Predictors of fall protective behaviors among Iranian community-dwelling older adults: an application of the protection motivation theory. Clinical interventions in aging. 2020;15:123.
17. MOROVATI SMA, Rouhani TN. Social support and self-care behaviors in diabetic patients referring to Yazd Diabetes Research Center. 2008.
18. Sadique MZ, Edmunds WJ, Smith RD, Meerding WJ, De Zwart O, Brug J, et al. Precautionary behavior in response to perceived threat of pandemic influenza. Emerging infectious diseases. 2007;13(9):1307.
19. Watkins RE, Cooke FC, Donovan RJ, MacIntyre CR, Itzwerth R, Plant AJ. Influenza pandemic preparedness: motivation for protection among small and medium businesses in Australia. BMC Public Health. 2007;7(1):157.
20. Ling M, Kothe EJ, Mullan BA. Predicting intention to receive a seasonal influenza vaccination using Protection Motivation Theory. Social Science & Medicine. 2019;233:87-92.
21. Zare Sakhvidi MJ, Zare M, Mostaghaci M, Mehrparvar AH, Morowatisharifabad MA, Naghshineh E. Psychosocial Predictors for Cancer Prevention Behaviors in Workplace Using Protection Motivation Theory. Advances in preventive medicine. 2015;2015:467498.
22. Lowe JB, Borland R, Stanton WR, Baade P, White V, Balanda Sun-safe behaviour among secondary school students in Australia. Health Education Research. 2000;15(3):271-81.
23. Jiang X, Elam G, Yuen C, Voeten H, de Zwart O, Veldhuijzen I, et al. The perceived threat of SARS and its impact on precautionary actions and adverse consequences: a qualitative study among Chinese communities in the United Kingdom and the Netherlands. International Journal of Behavioral Medicine. 2009;16(1):58-67.
24. Valigosky MA. Infection control perceptions and practices of spiritualcare providers: an application of the protection motivation theory: The University of Toledo; 2009.

25. Babazadeh T, Nadrian H, Banayejeddi M, Rezapour B. Determinants of Skin Cancer Preventive Behaviors Among Rural Farmers in Iran: an Application of Protection Motivation Theory. Journal of cancer education : the official journal of the American Association for Cancer Education. 2017;32(3):604-12.
26. Moeini B, Ezati E, Barati M, Rezapur-Shahkolai F, Mohammad Gholi Mezerji N, Afshari M. Skin Cancer Preventive Behaviors in Iranian Farmers: Applying Protection Motivation Theory. Workplace health & safety. 2019;67(5):231-40.
27. Bränström R, Chang Y-M, Kasparian N, Affleck P, Tibben A, Aspinwall LG, et al. Melanoma risk factors, perceived threat and intentional tanning: an online survey. European journal of cancer prevention: the official journal of the European Cancer Prevention Organisation (ECP). 2010;19(3):216.
28. Morowatisharifabad MA, Momeni Sarvestani M, Barkhordari Firoozabadi A, Fallahzadeh H. Predictors of unsafe driving in Yazd City, Based on protection motivation theory in 2010. The Horizon of Medical Sciences. 2012;17(4):49-59.
29. Floyd DL, Prentice-Dunn S, Rogers RW. A meta-analysis of research on protection motivation theory. Journal of applied social psychology. 2000;30(2):407-29.
30. Babazadeh T, Nadrian H, Banayejeddi M, Rezapour B. Determinants of skin cancer preventive behaviors among rural farmers in Iran: an application of protection motivation theory. Journal of Cancer Education. 2017;32(3):604-12.
31. Mohammadi S, Baghiani Moghadam MH, Noorbala MT, Mazloomi SS, Fallahzadeh H, Daya A. Survey about the role of appearance concern with skin cancer prevention behavior based on protection motivation theory. Journal of Dermatology and Cosmetic. 2010;1(2):70-7.
32. Tazval J, Ghafari M, Mohtashami Yeganeh F, Babazadeh T, Rabati R. Efficiency of protection motivation theory on prediction of skin cancer and sunlight preventive behaviors in farmers in Ilam county. J Health. 2016;7(7):656-67.
33. Zare M, Fallahzadeh H. Study of determinants of lung cancer protective behaviors in Esfahan steel company workers based on protection motivation theory. Tolooebehdasht. 2017;16(3):67-80.
34. Barati M, Bashirian S, Jenabi E, Khazaei S, Karimi-Shahanjarini A, Zareian S, et al. Factors Associated with Preventive Behaviours of COVID-19 among Hospital Staff in Iran in 2020: An Application of the Protection Motivation Theory. Journal of Hospital Infection. 2020.
35. Park JH, Cheong HK, Son DY, Kim SU, Ha CM. Perceptions and behaviors related to hand hygiene for the prevention of H1N1 influenza transmission among Korean university students during the peak pandemic period. BMC infectious diseases. 2010;10:222.
36. Khorsandi M. The assessment of the protectionmotivation theory construct of skin cancer preventive behaviors in rural women. Scientific Journal of Hamadan Nursing & Midwifery Faculty. 2016;24(4):229-37.
37. Leigh L, Taylor C, Glassman T, Thompson A, Sheu J-J. A Cross-Sectional Examination on the Factors Related to Emergency Nurses' Motivation to Protect Themselves against an Ebola Infection. Journal of Emergency Nursing. 2020.
38. Rippetoe PA, Rogers RW. Effects of components of protection-motivation theory on adaptive and maladaptive coping with ahealth threat. Journal of personality and social psychology. 1987;52(3):596.
39. Milne S, Sheeran P, Orbell S. Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. Journal of Applied Social Psychology. 2000;30(1):106-43.
40. Gu C, Chan CW, Twinn S, Choi KC. The influence of knowledge and perception of the risk of cervical cancer on screening behavior in mainland Chinese women. Psycho-Oncology. 2012;21(12):1299-308.
41. Sarkar U, Fisher L, Schillinger D. Is self-efficacy associated with diabetes self-management across race/ethnicity and health literacy? Diabetes care. 2006;29(4):823-9.
42. Grembowski D, Patrick D, Diehr P, Durham M, Beresford S, Kay E, et al. Self-efficacy and health behavior amongolder adults. Journal of health and social behavior. 1993:89-104.
43. Parsons JT, Halkitis PN, Bimbi D, Borkowski T. Perceptions of the benefits and costs associated with condom use and unprotected sex among late adolescent college students. Journal of adolescence. 2000;23(4):377-91.
44. Al-Hazmi A, Gosadi I, Somily A, Alsubaie S, Saeed AB. Knowledge, attitude and practice of secondary schools and university students toward Middle East Respiratory Syndrome epidemic in Saudi Arabia: A cross-sectional study. Saudi journal of biological sciences. 2018;25(3):572-7.
45. Chen Y, Jin Y, Zhu L, Fang Z, Wu N, Du M, et al. The network investigation on knowledge, attitude and practice about Novel coronavirus pneumonia of the residents in Anhui Province. Zhonghua yufang yi xue za zhi [Chinese journal of preventive medicine]. 2020;54:E004-E.

Figures

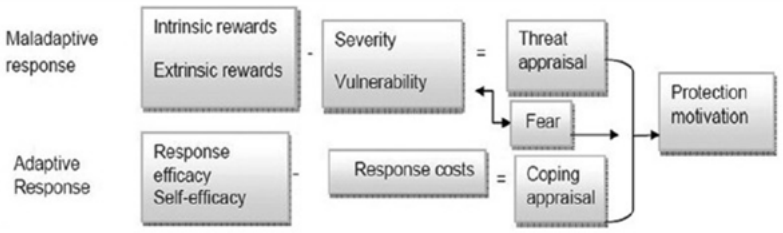

Figure 1

Framework of the Protection Motivation Theory (PMT).

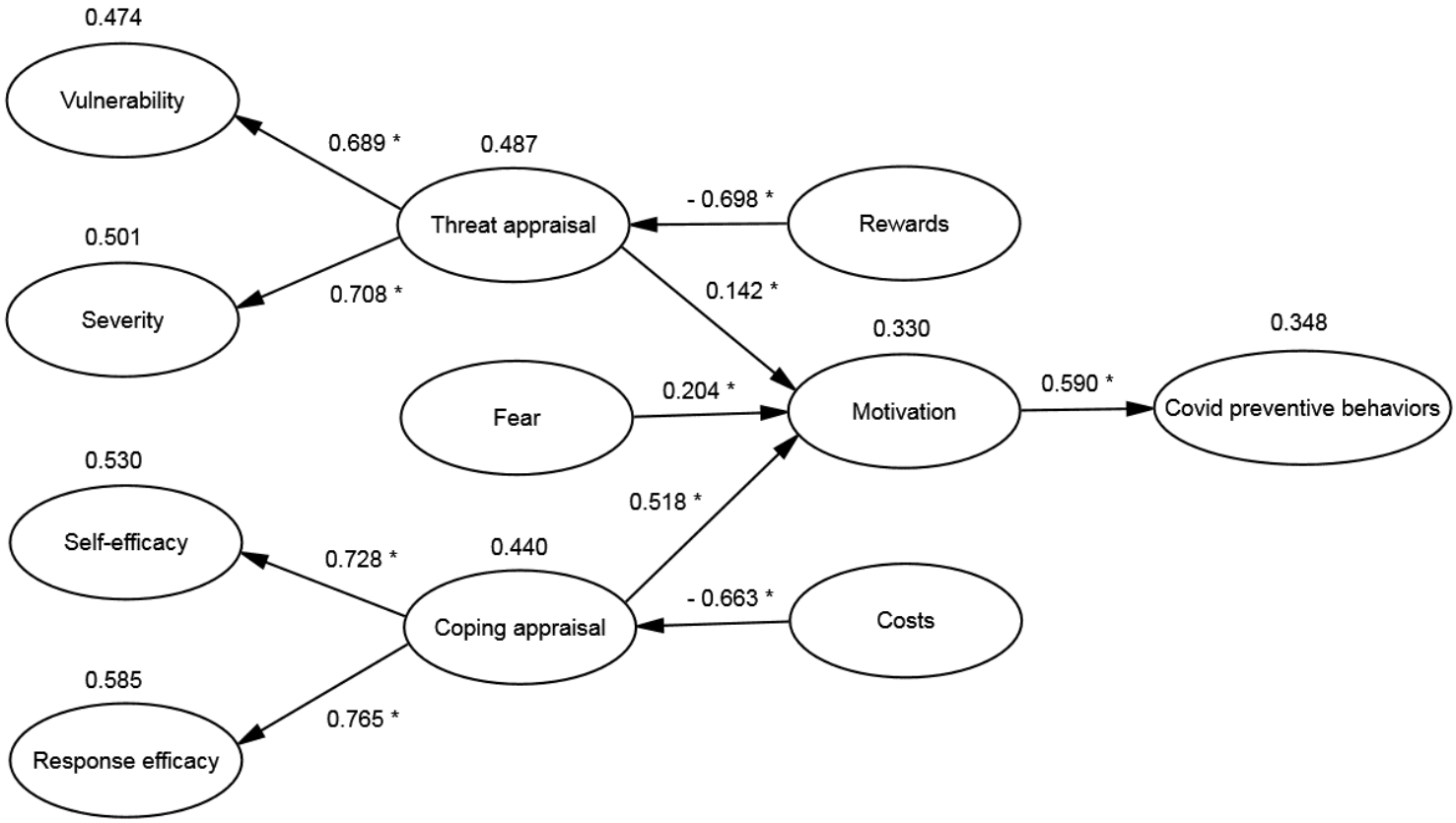

Figure 2

Structural equation modeling of Covid-19 protective behaviors *Significant at the 0.01 level.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Covid19Questionnaire2.docx