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Short report

Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: an application of the Protection Motivation Theory

S. Bashirian, E. Jenabi, S. Khazaei, M. Barati*, A. Karimi-Shahanjarini, S. Zareian, F. Rezapur-Shahkolai, B. Moeini

Social Determinants of Health Research Center, Hamadan University of Medical Sciences, Hamadan, IR Iran

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SUMMARY

This study was conducted to predict the preventive behaviours of healthcare workers (HCWs) towards COVID-19 based on the Protection Motivation Theory (PMT). This cross-sectional and analytical study was conducted on 761 HCWs in Hamadan, Iran, using multi-stage random sampling. The preventive behaviours against COVID-19 among HCWs were assessed at a relatively desirable level. Based on the PMT, threat and coping appraisal were predictors of protection motivation to conduct COVID-19 preventive behaviours ($P < 0.001$). The intention was also predictive of COVID-19 preventive behaviours ($P < 0.001$). Consideration of personnel's self-efficacy and their knowledge regarding the effectiveness of protective behaviours in designing staff training programmes are recommended.

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Introduction

A novel coronavirus (now designated SARS CoV2) was first reported in Wuhan, Hubei province, China, in December 2019 [1]. The COVID-19 pandemic has since reached an unprecedented magnitude, with approximately 2 million cases and 150,000 deaths worldwide at the time of writing. Iran is to date the most affected country by COVID-19 in the Middle East and North African region, and is one of the countries where the virus spread quickly and early. The Iranian Ministry of Health and Treatment reported that as of 15 April, there had been 76,389 confirmed cases of the infection and 4777 deaths in Iran

due to COVID-19. Also, more than 100 Iranian health workers died from the coronavirus [2].

Ensuring the safety of healthcare workers (HCWs) is not only crucial in protecting them against the virus but also in preventing the transmission of the virus [3]. Understanding the behaviours of HCWs, including the wearing of appropriate personal protective equipment (PPE), is therefore important in COVID-19 prevention. In this regard, the World Health Organization (WHO) has identified education as one of the most important components of prevention programmes [4]. Experts also believe that one of the reasons for the failure of educational programmes is the lack of attention to analytical studies and their inability to consider psycho-social models as an intellectual framework in educational planning. Among the theories that have been used in various studies to predict

* Corresponding author.

E-mail address: barati@umsha.ac.ir (M. Barati).

Table I

Mean, standard deviation (SD), percentage, range of scores and Pearson correlation coefficients among the constructs of the Protection Motivation Theory (n = 761)

Variables	1	2	3	4	5	6	Mean ± SD	Percentage	Range
1. Susceptibility	1						8.11 ± 1.56	73.0	3–10
2. Severity	0.38*	1					12.19 ± 2.25	76.6	3–15
3. Response efficacy	0.05	0.25*	1				20.27 ± 3.49	76.35	5–25
4. Self-efficacy	0.06	0.19*	0.47*	1			20.19 ± 3.44	75.95	5–25
5. Response cost	0.07	0.26*	-0.03	0.004	1		6.63 ± 2.32	57.88	2–10
6. Intention	0.21*	0.24*	0.27*	0.37*	0.13*	1	4.37 ± 0.81	84.25	1–5

* $P < 0.001$.

protective behaviours is the Protective Motivation Theory (PMT) [5].

Considering the importance of identifying the determinants of the preventive behaviours of COVID-19 in HCWs in the design and implementation of preventive programs, this study was conducted for predicting the preventive behaviour of HCWs towards COVID-19 based on the PMT.

Methods

The present cross-sectional and analytical study was conducted in five teaching hospitals of the Hamadan City, the capital of Hamadan Province, affiliated to Hamadan University of Medical Sciences in March 2020. The study population was 25% of hospital staff, selected through multi-stage sampling (sequence of Stratified simple random sampling) to participate in the study. All agreed to participate and complete the questionnaire. The ethics committee of the Hamadan University of Medical Sciences approved the study.

Data were collected using a self-reported questionnaire. The questionnaire consisted of two sections – demographic characteristics and the PMT constructs. The demographic and background factors included age, gender, education, work experience, and job. The PMT constructs were assessed by 23 questions composed under six major constructs: (1) perceived vulnerability; (2) perceived severity; (3) self-efficacy; (4) response efficacy; (5) response cost; and (6) protection motivation. The items were rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The construct perceived susceptibility was assessed by two items, i.e. "It is unlikely that I will be infected with the coronavirus". The perceived severity was assessed by three items, i.e. "Coronavirus disease can lead to death". The perceived self-efficacy was assessed by five items, i.e. "I can use the mask constantly in my work environment". The response efficacy was assessed by five items, i.e. "Disinfecting surfaces and equipment prevent coronavirus." The response cost was evaluated by two items, i.e. "I feel that protecting yourself against coronavirus is time-consuming." And finally, the protection motivation (behavioural intention) was assessed by one item, i.e. "I intend to observe the recommended precautions until the end of the coronavirus epidemic." According to the theoretical assumptions, the threat appraisal score is the sum of the perceived susceptibility and severity scores. Also, the coping appraisal score is the sum of the self-efficacy and response efficacy scores minus the response cost score.

COVID-19 preventive behaviours were measured by five items rated by a three-point Likert scale ('always', 'sometimes' and

'never' scored 2, 1 and 0, respectively). The validity of the questionnaire was confirmed using the viewpoints of 10 health-education experts. The reliability of the questionnaire was investigated by calculating internal consistency.

Correlation between PMT components was assessed by Pearson's correlation coefficient. The mean of threat and efficacy score were compared according to demographic characteristics using *t*-test and analysis of variance (ANOVA). A univariate linear regression analysis was performed to screen potentially significant determinants of intention and behaviour. All statistical analyses were conducted in STATA version 14 with a significant level of less than 5%.

Results and discussion

A total of 761 HCWs were enrolled with a mean age of 35.38 ± 8.23 years (range: 22–60); 364 (47.83%) were male. The mean duration of employment was 10.32 ± 8.57 years. Seventy-three (9.59%), 231 (24.31%), 185 (24.31%), 81 (10.64%), 114 (14.98%) and 77 (14.98%) persons were physicians, nurses, paramedics, technician staff, service personnel, and office staff, respectively.

There was a positive and significant correlation between intention and other constructs of the PMT model, including: perceived susceptibility, severity, response efficacy, self-efficacy, and response cost ($P < 0.001$) (Table I). The response cost (57.8%) and intention (84.25%) had the lowest and highest percentage of the mean from the maximum obtainable score among structures of the model, respectively.

Protective behaviours of HCWs against COVID-19 showed that wearing a glove for all procedures (43.3%) and using a face mask at any time (51.8%) were the least frequent preventive behaviours; 7.9% and 3.7% of participants never used gloves or a mask during patient care, respectively; 87% and 84.6% always washed their hands frequently with water and soap and avoided mixing with others during the shift. Overall, preventive behaviours against COVID-19 among HCWs, with 73.1% of the mean from the maximum obtainable score were assessed at a relatively desirable level.

According to the results, scores of threat and coping appraisal were compared according to sub-groups of demographic variables. Females had a higher score of threat (20.68 ± 2.99 vs. 19.89 ± 3.33 , $P < 0.001$). Technicians had the lowest score of threat (19.11 ± 3.55), and paramedics had a higher score (21.11 ± 2.9) ($P < 0.001$).

In Table II, we modelled the predictors of the intention and behaviour based on the PMT model. The threat and coping appraisal had a predicted increase of 0.34 and 0.085,

Table II

Linear regression analysis to predict the intention and behavior based on the constructs of the Protection Motivation Theory

Intention				
Variables	β	95% confidence interval	<i>P</i>	<i>R</i> ²
Threat appraisal	0.34	0.26, 0.43	<0.001	0.1
Coping appraisal	0.085	0.052, 0.12	<0.001	
Constant	2.57	2.18, 2.96	<0.001	
Behavior				
Variables	β	95% confidence interval	<i>P</i>	<i>R</i> ²
Intention	0.72	0.58, 0.86	<0.001	0.12
Constant	5.01	4.39, 5.64	<0.001	

respectively, in the mean of the intention score ($P < 0.001$). Conversely, each increment in intention score was associated with a 0.72 increase in behavior score ($P < 0.001$).

In this study, the protective behaviors against the COVID-19 evaluated at a relatively favourable level. By contrast, protective behaviours against workplace illnesses and injuries among healthcare staff and students, such as nurses and physicians, were unfavourable in other studies [6,7]. Discrepancies in the findings of different studies may be related to factors such as awareness, the perceived threat of illnesses, and training provided in the workplace. The hospital environment is a closed work environment in which the staff members are often exposed to stress and pressure. Also, in this setting, they have direct contact with patients infected with coronavirus. Hence, educational interventions to protect HCWs from diseases such as coronavirus are essential.

In the present study, continuous use of masks and wearing of gloves for all procedures was less frequent by HCWs, despite these being key protective measures according to the WHO [4]. The probability of physicians and nurses having contact with contaminated surfaces while taking care of respiratory patients in a non-outbreak setting was reported as 90%, whereas the rate of mask use by HCWs in the same study was 29%. [8]. In contrast, Rajoura *et al.* reported that 82.6% of physicians and 85% of Indian nurses used masks in their workplace at the time of the epidemic H1N1 influenza [9]. The lower levels of PPE declared in our study may be attributable to low levels of awareness, no habit of mask and glove wearing, perception that they interfere with performing tasks, lack of time, and lack of understanding of the importance of observing health and safety principles.

As the most important hypothesis of the PMT, as well as the most important hypothesis of the present study, the results showed that both threat appraisal and coping appraisal predicted behavioural intention. In other words, according to the hypothesis of the PMT that suggests two decisions process to engage or not engage in health-related behaviours, the threat appraisal components have a higher ability to predict the behavioural intention. Huang *et al.* showed that emotion-focused and problem-focused responses were predicted coping strategies of nurses and nursing students at the time of COVID-19 outbreaks, which is consistent with the results of the present study [10].

This study showed that HCWs were not at a desirable level of perceived efficiency; rather, their assessed perceived threat was relatively at a desirable level. As a result, 35.5% of

participants were on the fear control path. Considering the assumptions of the PMT, first, the threat is assessed in terms of severity. Next, by increasing the perceived threat, a second evaluation is motivated on the effectiveness of the recommended strategies. In this situation, in addition to evaluating the effectiveness of recommended strategies, the individuals also evaluate their level of effectiveness. When the threat is not considered seriously (low perceived susceptibility and severity), there is a low motivation to focus on the subject, making people superficially evaluate the effectiveness of recommended strategies. In other words, if people do not grasp the threat and do not understand its severity, they will easily ignore the relevant available information. In contrast, similar to the findings of the present study, despite the perceived threat, when people find the recommended strategy ineffective with low self-efficacy, or find themselves unable to act against the recommended strategy and to prevent a serious threat, the fear control process will prevail over the danger control process [5]. Considering the findings of the present study, increasing the perceived efficacy of protective behaviours against COVID-19 by HCWs is recommended as an educational priority.

One of the limitations of this study is that evaluating behaviour by self-reporting can cause bias and misrepresentation. Furthermore, the reluctance of some members of the research community to participate in the study was another limitation. However, the findings showed that protective behaviours against COVID-19 were at relatively favourable levels among HCWs. HCWs are expected to be at the highest level of threat and efficiency and experience the process of danger control. Therefore, future training programmes must consider the level of self-efficacy of HCWs and increase their knowledge regarding the effectiveness of recommendation strategies to perform protective measures against the COVID-19.

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Conflict of interest statement

The authors report no conflicts of interest.

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References

- [1] Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395(10223):497–506.
- [2] The Ministry of health and medical education. 2020. Available at: <https://www.trt.net.tr/persian/yrn/2020/03/02/gzrshy-z-akhryn-wd-yt-wyrws-khrwn-dr-yrn-z-nkhr-t-khtr-1364590>.
- [3] Park JE, Jung S, Kim A, Park JE. MERS transmission and risk factors: a systematic review. *BMC Public Health* 2018;18:574 [last accessed April 2020].
- [4] World Health Organization. Coronavirus disease (COVID-19) technical guidance: Surveillance and case definitions. 2020. Available at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/surveillance-and-case-definitions> [last accessed March 2020].

- [5] Rogers RW, Prentice-Dunn S. Protection Motivation Theory. In: Gochman D, editor. Handbook of health behavior research. Determinants of health behavior: personal and social, vol. 1. New York: Plenum; 1997. p. 113–32.
- [6] Nga TWY, Cowling BJ, ChiSo H, Ip DKM, Liao Q. Testing an integrative theory of health behavioural change for predicting seasonal influenza vaccination uptake among healthcare workers. *Vaccine* 2020;38(3):690–8.
- [7] Fathi Y, Barati M, Zandiyeh M, Bashirian S. Prediction of preventive behaviors of the needlestick injuries during surgery among operating room personnel: Application of the health belief model. *Int J Occup Environ Med* 2017;8:232–40.
- [8] Phan LT, Maita D, Mortiz DC, Bleasdale SC, Jones RM. Environmental contact and self-contact patterns of healthcare workers: implications for infection prevention and control. *Clin Infect Dis* 2019 Sep 13;69(Supplement_3):S178–84.
- [9] Rajoura OP, Roy R, Agarwal P, Kannan AT. A Study of the swine flu (H1N1) epidemic among health care providers of a medical college hospital of Delhi. *Indian J Community Med* 2011;36(3):187–90.
- [10] Huang L, Xu F, Liu H. Emotional responses and coping strategies of nurses and nursing college students during COVID-19 outbreak. medRxiv preprint. 2020. <https://doi.org/10.1101/2020.03.05.20031898>.