Original Article

Determinants of prevention behaviours against COVID-19 disease based on health belief model

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Received: 25 Feb 2023 **Accepted:** 24 Oct 2023 **Published:** 01 Jan 2024

Abstract

Backgrounds: Due to the outbreak and pandemic of COVID-19, the following of recommended preventive guidelines and health behaviors in community is important, in order to further control this disease. The present study was conducted among oil industry shift workers, as a high-risk group, to investigate the determinants of prevention behaviors against COVID-19 disease based on Health Belief Model.

Methods: This cross-sectional research was performed among 250 shift workers who were randomly selected from the oil field of Khuzestan province of southern Iran. Data collection tools were a questionnaire that included demographic characteristics, Health Belief Model and prevention behaviors questionnaires and also knowledge questionnaire. Statistical analysis was done using SPSS.

Results: Correlation analysis showed positive correlations between the behavior and the perceived benefit, self-efficacy, perceived severity, perceived susceptibility, and knowledge, while negative correlation was observed between the behavior and perceived barrier. Results determined that Health Belief Model was able to explain 54% of the variance in the COVID-19 prevention behaviors. According to the linear regression analysis, the most predictive variable was perceived benefits, and the second one was self-efficacy.

Conclusion: Designing educational interventions based on Health Belief Model, in future studies, can be considered as a suitable framework to adherence and follow the health behaviors of COVID-19 and also to correct the individuals' beliefs. Furthermore, health information groups and health educators must highlight the points to overcome the behavior obstacles and consequently to increase self-efficacy, and also must emphasize the benefits of preventive behaviors, especially in high-risk groups.

Keywords: Coronavirus; Health Belief Model; Protective behaviors.

Cite this article as: Mohammadnabizadeh S, Ghavami V. Determinants of prevention behaviours against COVID-19 disease based on health belief model. *Soc Determinants Health*. 2024;10(1):1-10. DOI: http://dx.doi.org/10.22037/sdh.v10i1.41421

Introduction

On March 2020, the World Health Organization announced COVID-19 a universal pandemic (1). While COVID-19 keeps developing and its prevalence has been determined as an emergency of public health, the societies should take more actions in order to support effective control measures and decrease more transmission around the word (2). Washing hand with water and soap, using mask, covering mouth when sneezing or coughing, appropriate ventilation and social distancing are some best methods to prevent of the COVID-19 outbreak (3).

Although, depending on the kind of vaccines, they have demonstrated effective in protecting people against COVID-19, but it is recognized that vaccinated people may still distribute the virus and can be infected (4).

In Iran, shift workers of petroleum industry are one of the most at risk groups of COVID-19 disease. These workers often work 14 days in a row, daily 12 hours, and then 14 days off in far districts. Consecutive trips by train, plane, bus, or car because of the type of job, using a shared service to move workers to job place (usually by bus), using a shared dining room and even shared bedrooms at work, and also using a shared bathroom, are important factors in transmitting the disease to colleagues at work and families. However, based on our knowledge, in the field of educational interventions of COVID-19 disease among oil industry shift workers, no significant study has been done. Therefore, it is necessary to investigate which factors can affect to health instructions adherence, and whether theoretical models of health can be effective of adopting these instructions, especially among high-risk groups.

The Health Belief Model (HBM) is an efficient model in health behavior sciences that presents a comprehensive framework for understanding which factors may affect the adoption of health behaviors (5). Based on HBM, if people find themselves vulnerable in unhealthy situations (perceived susceptibility), understand the consequence and severity of the disease (perceived severity), believe on effective results of preventive actions (perceived benefits) and believe that advantages are greater than the barriers (perceived barriers), along with confidence to carry out the healthy behavior (self-efficacy); it is more likely that the recommended health behavior will be adopted (6, 7). In previous studies, this model has been demonstrated suitable for assessing different preventive health behaviors, including brucellosis (8), cardiovascular disease (9), COVID-19 (10), etc. Due to the outbreak and pandemic of COVID-19, the following of recommended preventive guidelines and health behaviors in community is important, in order to further control this disease (11). Given the close proximity and shared living spaces in the oil industry, it is crucial to implement effective preventive measures to decrease the transmission of COVID-19 among these workers. Indeed, the unique circumstances and working conditions of oil factory shift workers, especially in the context of the COVID-19 pandemic, make it even more crucial to study and address their specific needs and challenges. The fact that these workers have to travel frequently, often using public transportation, increases their risk of contracting and transmitting the disease. Additionally, the shared facilities at the workplace, including bathrooms, dining rooms, and bedrooms for accommodation, pose additional challenges for preventing the spread of COVID-19. By addressing these specific challenges through research and targeted interventions, we can better support this high-risk group in adopting preventive behaviors and mitigating the impact of COVID-19. The present study was conducted among oil industry shift workers, as a high-risk group, to investigate the determinants of prevention behaviors against COVID-19 disease based on HBM. By understanding the determinants of these behaviors based on the HBM framework, targeted interventions can be developed to effectively communicate the importance of prevention and empower individuals to take necessary actions to protect themselves and others from COVID-19.

Methods

Study participants and sampling

This cross-sectional investigation was performed among onshore shift workers t (14 days in a row, daily 12 hours, and then 14 days off) who were selected through simple random sampling using the list of workers from the oil field of Khuzestan province of southern Iran (June 2022).

Considering the purpose of the study and taking into account the first type error (α) of 0.05, standard deviation of 4.17 (10), precision of 0.5, and taking into account the loss of 15%, the sample size was determined based on the following formula of 250 people:

$$n = \frac{N \times \sigma^2 \times Z^2_{1-\frac{\alpha}{2}}}{(N-1) \times d^2 + \sigma^2 \times Z^2_{1-\frac{\alpha}{2}}}$$

The approval of this study was received from the ethics committee of Mashhad University of Medical Sciences and the written consent was taken from workers, too. The criteria for entering the study included affirming consent to take part in this study.

Data collection tool

Data collection tools were a questionnaire that included demographic characteristics, HBM and prevention behaviors questionnaires and also knowledge questionnaire. Demographic characteristics determined by questions included age, married status, education and the years of working experience. Knowledge questionnaire which it's validity was affirmed by Ranjbar Roghani et al included of 55 items of 4 dimensions (COVID-19 nature (14 question), ways of transmission (15 question), prevention and care (18 question), treatment (8 question)) (12). For the wrong and I don't know answer 0 score, and for the true answer 1 score were considered. Knowledge questionnaire was evaluated by 25 workers who did not participate in this study to measure reliability and Cronbach's alpha was 0.75.

HBM questionnaire (25 items) which it's validity was affirmed by Shahnazi et al (10), included: Self-efficacy was measured by 1 question (I have capability to successfully carry out the health behaviors of COVID-19), Perceived barriers was assessed through 8 items (e.g. it is difficult for me to stay at home in order to prevent the COVID-19 disease), Perceived benefits was included 2 questions about the benefits of protective behaviours (e.g. this disease can be prevented through washing hands with water and soap, regularly), Perceived susceptibility which was measured by 3 items (e.g. I am more probably to get COVID-19), and Perceived severity was investigated by 3 items (e.g. this disease is so dangerous) (10). The scores of questions were calculated using Likert scale (five-point) from 1=strongly disagree to 5=strongly agree. Protection behaviours contained eight 5-point scale questions from always=5 to never=1 about the preventive actions against COVID-19 in the last few weeks such as "I don't leave my home unless absolutely required" (10). Questionnaire was evaluated by 25 workers who did not participate in this study to measure reliability and Cronbach's alpha was between 0.73 to 0.86.

Statistical analysis

Statistical analysis was done using SPSS 24. Quantitative findings were displayed as frequency, percentage, mean, and standard deviation. Analyses of linear and hierarchical regression were done in six steps to measure the role of variables and also the predictive power of used model. Furthermore, Pearson correlation examination was performed to investigate the relationships between behaviour and other variables.

Results

The mean age of workers was 38.80±5.54 years. The mean working experience was 10.48±3.41 years. 168 of the workers were married (49.7%), 82 were single (24.3%). Related to education, 49 were Diploma (14.5%), 128 were Associate degree (37.9%), 59 were Bachelor science (17.5%), and 14 were Master science (4.1%). The mean and standard deviation of knowledge and HBM constructs are described in Table 1.

The results of correlation analysis indicated significant positive correlations between behavior and self-efficacy (r=0.62),

Table 1. Mean and Standard deviation of knowledge and the HBM constructs

Variables	Mean	Standard Deviation	Range
Knowledge	22.75	8.62	0-54
Self-efficacy	1.28	0.45	1-5
Perceived severity	7.74	2.29	3-15
Perceived susceptibility	9.07	2.21	3-15
Perceived benefit	6.05	1.57	2-10
Perceived barrier	29.27	3.48	8-40
Behavior	17.76	4.55	8-40

Table 2. Correlation matrix among knowledge, HBM constructs and preventive behaviors

Variables	1	2	3	4	5	6	7
Behavior	1	-0.42**	0.66**	0.62**	0.18**	0.49**	0.50**
Perceived barrier		1	-0.31**	-0.31**	-0.08	-0.40**	-0.18**
Perceived benefit			1	0.69**	0.20**	0.69**	0.57**
Self-efficacy				1	0.19**	0.57**	0.77**
Perceived severity					1	0.21**	0.19**
Perceived susceptibility						1	0.46**
Knowledge							1

** Correlation is significant at the 0.01 level (2-tailed)

Table 3. Analysis of Hierarchical Multiple Regression to predict behaviour

Models	Variables	ß standard	Significant	R^2	P-value
Step 1	Perceived susceptibility	0.49	0.00	0.24	0.00
Step 2	Perceived susceptibility	0.47	0.00	0.25	0.00
	Perceived severity	0.08	0.15		
Step 3	Perceived susceptibility	0.06	0.37	0.44	0.00
	Perceived severity	0.04	0.38		
	Perceived benefit	0.61	0.00		
Step 4	Perceived susceptibility	-0.03	0.69	0.49	0.00
	Perceived severity	0.04	0.34		
	Perceived benefit	0.60	0.00		
	Perceived barrier	-0.24	0.00		
Step 5	Perceived susceptibility	-0.07	0.28	0.53	0.00
	Perceived severity	0.03	0.45		
	Perceived benefit	0.44	0.00		
	Perceived barrier	-0.22	0.00		
	Self-efficacy	0.28	0.00		
Step 6	Perceived susceptibility	-0.07	0.27	0.54	0.00
	Perceived severity	0.03	0.49		
	Perceived benefit	0.44	0.00		
	Perceived barrier	-0.23	0.00		
	Self-efficacy	0.24	0.004		
	Knowledge	0.06	0.41		

between behavior and perceived benefit (r=0.66), between behavior and perceived severity (r=0.18), between behavior and perceived susceptibility (r=0.49), and between behavior and knowledge (r=0.50). Moreover, negative correlation was obtained between perceived barrier and behavior (r=-0.42) (Table 2).

The analysis of hierarchical regression was performed in six steps (Table 3). At the first step, by entering the perceived susceptibility was indicated 24% of the variance in the COVID-19 prevention behaviors (P<0.001). After entering the perceived severity, R^2 was increased and accounted 25% of the variance in the

prevention behaviors (P<0.001). The power of the model significantly was increased by entering perceived benefit, at the third step (R^2=0.44). At the next step, by entering the perceived barrier was indicated 49% of the variance in the COVID-19 prevention behaviors (P<0.001). After entering the self-efficacy, R^2 was increased and accounted 53% of the variance in the prevention behaviors (P<0.001). The power of the final model, at the sixth step, was increased by entering the knowledge variable (R^2=0.54).

Discussion

Correctly recognizing factors that effect on protective actions needs to use of behavior change theories and appropriate plans (3). The present study was conducted among oil industry shift workers, as a high-risk group, to investigate the determinants of prevention behaviors against COVID-19 disease based on HBM.

Despite the public educations about COVID-19 disease, mean score of workers' knowledge was lower than average (22.75 out of 55), a line with the study by Khasawneh et al that showed the medical students were not adequately aware of the COVID-19 risk factors (13). Furthermore, results of this study showed that the workers with higher levels of COVID-19 knowledge had more behavior scores. results of The study by Mahmoodabad et al related to prevention behaviors of falls, indicated the significant correlation between behavior and knowledge (14). Given that the rate of outbreak of COVID-19 infectious disease is higher than others, one of the important factor in disease controlling is increasing community knowledge towards COVID-19 disease, which can play a main role in decreasing the growth trend of this disease (15).

The current study indicated that the workers had a moderate-risk perception of COVID-19. This suggests that they recognized the potential risks associated with the virus, but their perception may not have been high enough to motivate them to engage in preventive behaviors consistently. Moreover, we found that workers' perception of personal risks of COVID-19, represented via perceived severity and susceptibility, had significant positive correlation with behavior. This means that individuals who perceived COVID-19 as a severe and highly likely threat were more likely to adopt preventive behaviors. Results of the study by Lin et al about preventive behaviors of AIDS indicated the significant correlation between perceived threat and behaviors (16). This highlights the importance of increasing public risk perception, as a higher perception of risk can lead to improved adherence to preventive measures and better epidemic control (17). Therefore, it is crucial to enhance workers' awareness of the potential harms and complications associated with COVID-19. By providing information about the severity of the virus and its potential consequences, individuals may develop a greater sense of fear or concern, which can motivate them to adhere to prevention guidelines more consistently (7). Educational interventions should focus on highlighting the risks and negative outcomes associated with COVID-19. By emphasizing the potential health complications, hospitalizations, long-term effects, and even mortality linked to the virus, interventions can help individuals understand the seriousness of the situation and encourage them to take preventive measures seriously.

Mean score of perceived benefits subscale was 6.05 out of 10. Furthermore, the study findings indicated that there is a positive significant correlation between behavior and perceived benefits, meaning that, workers would carry out the recommended preventive actions because of the high levels of perceived benefits which shows that the desired behaviors were efficient and can be implemented among this population. This finding is consistent with a study conducted in a Chinese sample that also examined health behavior adoption

based on the HBM. In that study, perceived benefits were found to be significantly related to preventive behaviors (18). This further supports the notion that perceiving the benefits of engaging in preventive actions can motivate individuals to adopt and maintain these behaviors. Based on these findings, it is important for educational interventions to emphasize and communicate the specific benefits of engaging in preventive actions against COVID-19. By highlighting the positive outcomes associated with these behaviors, such as reducing the risk of infection, protecting oneself and others, and contributing to overall public health, interventions can effectively motivate individuals to engage in these behaviors (9). Furthermore, interventions should aim to address any misconceptions or doubts individuals may have about the benefits of preventive actions. By providing accurate information and evidence-based explanations about how these behaviors can effectively prevent the spread of COVID-19, interventions can help individuals make informed decisions and prioritize their health and well-being.

Based on our results, perceived barriers were found to be relatively high (29.27 out of 40) and had a negative correlation with behaviour. Studies showed that the excessive obstacles can act as a deterrent and prevent the desired behaviour adoption (19). When individuals perceive numerous barriers or challenges to engaging in preventive actions, they may feel overwhelmed or discouraged, leading to a decreased motivation to adopt these behaviors (7). These barriers can include factors such as lack of access to resources or information, financial constraints, social or cultural norms, and personal beliefs or attitudes. To address this issue, educational interventions should focus on identifying and addressing the specific barriers that individuals face in adopting preventive behaviors against COVID-19. By providing practical solutions, resources, and support to overcome these barriers, interventions can empower individuals to take action and overcome the obstacles they encounter. Additionally, interventions should aim to change individuals' perceptions of these barriers by providing accurate information and evidence-based explanations. By addressing misconceptions or fears related to the barriers and highlighting potential solutions or alternatives, interventions can help individuals develop a more positive outlook and increase their confidence in overcoming these obstacles. Increasing self-efficacy, as the level of confidence of successfully carry out the preventive behaviors, can play the main role to overcome the obstacles (20).

In this investigation we found that the mean score of workers' self-efficacy was low (1.28 out of 5). It was also shown to be positively correlated with behaviors, a line with previous studies such as Dastgerdi et al (21) and Aligol et al (8). Adherence to a certain behavior requires effort and determination, and individuals need to believe in their own capabilities to successfully carry out that behavior (22). When individuals have low self-efficacy, they may doubt their ability to adopt and maintain preventive behaviors, leading to a decreased motivation to engage in these actions (23). This could show why in most investigations self-efficacy has been the most significant predictor of behavioral changes (23). To enhance self-efficacy among workers, educational interventions should focus on building confidence and providing support. Interventions can include strategies such as setting achievable goals, providing feedback and reinforcement for successful behavior change, modeling desired behaviors, and offering skills training or resources. By empowering individuals with the belief that they have the capability to carry out preventive behaviors effectively, interventions can increase motivation and promote sustained adherence to these actions.

It is indeed noteworthy that the mean score

of behavior in this study was low, with a score of 17.76 out of 40. This suggests that workers in this population were not engaging in preventive behaviors against COVID-19 to a desirable extent. The low levels of self-efficacy among workers may contribute to this low level of behavior. As mentioned earlier, self-efficacy plays a crucial role in adherence to health behaviors. When individuals have low confidence in their ability to carry out these behaviors successfully, they may be less motivated to engage in them (20, 22). Additionally, the HBM suggests that perceived benefits and perceived barriers are two key variables that influence the performance of protective behaviors against COVID-19. Studies have shown that when individuals perceive higher levels of benefits associated with engaging in these behaviors and lower levels of barriers or obstacles, they are more likely to engage in preventive actions (3). To address this issue, interventions should focus on enhancing self-efficacy and addressing perceived barriers while emphasizing the perceived benefits of engaging in preventive behaviors against COVID-19. By providing support, building confidence, and addressing misconceptions or doubts about the effectiveness of these actions, interventions can motivate individuals to overcome barriers and adopt these behaviors.

Results of this investigation determined that HBM was able to explain 54% of the variance in the COVID-19 prevention behaviors. This suggests that the HBM framework is a valuable tool for understanding and predicting these behaviors in this specific population. The linear regression analysis revealed that two variables, perceived benefits and self-efficacy, were particularly predictive of COVID-19 prevention behaviors. Perceived benefits had a regression coefficient (B) of 0.44, indicating that individuals who perceived greater benefits of following health behaviors against COVID-19 were more likely to engage in preventive actions. This finding aligns with previous studies that have shown a positive association between perceived benefits and adherence to health behaviors for protecting oneself and others from COVID-19 (24). Similarly, self-efficacy had a regression coefficient (B) of 0.24, indicating that individuals with higher levels of self-efficacy were more likely to engage in preventive health behaviors. Self-efficacy refers to an individual's belief in their ability to successfully perform a behavior. The association between self-efficacy and preventive health behaviors has been supported by previous research as well (7). These findings highlight the importance of addressing perceived benefits and self-efficacy in educational interventions aimed at promoting COVID-19 prevention behaviors among oil factory workers. By emphasizing the benefits of these behaviors, such as protecting oneself and others from the virus, and by building individuals' confidence in their ability to perform these actions effectively, interventions can effectively motivate and empower workers to adopt preventive measures. Educational interventions should focus on providing information about the specific benefits of COVID-19 prevention behaviors, such as reducing the risk of infection and preventing transmission to colleagues and family members. Additionally, interventions should aim to enhance individuals' self-efficacy by providing resources, support, and training opportunities that help them develop confidence in their ability to carry out these behaviors.

Related to limitation of this research, all of the data were self-reported and can be subject to bias. This study is first of its kind which was conducted among oil industry shift workers, as a high-risk group, to investigate the determinants of prevention behaviors against COVID-19 disease based on HBM. In addition, knowledge was applied in this study along with the main HBM constructs. we believe our results can represent guidance to improve the adoption

of protection behaviors of COVID-19 disease.

Based on the findings, health information groups and health educators should focus on addressing the barriers and obstacles that may hinder individuals from adopting preventive behaviors. By providing information and resources that help individuals overcome these barriers, such as addressing misconceptions or fears, interventions can increase self-efficacy and empower individuals to take action. Additionally, it is crucial for health educators to emphasize the benefits of preventive behaviors, particularly among high-risk groups. By highlighting the positive outcomes associated with these behaviors, such as reducing the risk of infection and protecting oneself and others from the virus, interventions can motivate individuals to prioritize and adhere to these practices. Furthermore, future studies should consider designing educational interventions based on the HBM. The HBM provides a suitable framework for understanding individuals' beliefs and attitudes towards health behaviors, including adherence to preventive measures against COVID-19. By tailoring interventions to address specific HBM constructs, such as perceived susceptibility, severity, benefits, barriers, and self-efficacy, researchers can effectively promote adherence to preventive behaviors and correct any misconceptions or negative beliefs.

Conclusion

In this study, correlation analysis showed significant correlations between the knowledge, HBM constructs and preventive behaviors. Furthermore, main predictors of protective behaviors against COVID-19 included higher perceived benefits and self-efficacy. Therefore, health information groups and health educators must highlight the points to overcome the behavior obstacles and consequently to increase self-efficacy, and also must emphasize the benefits of preventive behaviors, especially in high-risk groups. Designing educational interventions based on HBM, in future studies, can be considered as a suitable framework to adherence and follow the health behaviors of COVID-19 and also to correct the individuals' beliefs.

Authors' contributions

Sahar Mohammadnabizadeh participated in the writing and design of the study, performed the statistical analysis, read the paper critically for theoretical content and interpretation of study findings, and drafted the manuscript. Vahid Ghavami participated in design of the study and statistical analysis.

Acknowledgements

The authors gratefully acknowledge the financial support of Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran, and Research Chancellor of Mashhad University of Medical Sciences.

Funding/Supports

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Informed consent

At the beginning of the research, informed consent was taken from all students studied.

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