ORIGINAL RESEARCH ARTICLE

COVID-19 Outbreak: Effect of an Educational Intervention Based on Health Belief Model on Nursing Students' Awareness and Health Beliefs at Najran University, Kingdom of Saudi Arabia

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Abstract

This study aimed to investigate the effect of an educational intervention based on the health belief model (HBM) about COVID-19 on nursing students' awareness and health beliefs. A true-experimental research design was conducted at nursing college, Najran University, KSA. A comprehensive sampling was followed to include all female students at the colleges (164 students). The sample was divided randomly into intervention (82) and control group (82). The educational intervention was designed and conducted based on the HBM through four sequential phases: assessment, planning, implementation, and evaluation. The current study results indicated no statistically significant differences between intervention and control groups concerning their demographic characteristic, awareness, and health beliefs before intervention. After intervention, significant differences ($p < 0.05$) were observed between intervention and control groups in their awareness and all HBM constructs regarding COVID19. There were positive, statistically significant correlations ($P < 0.05$) between participants' total HBM score and their total awareness score. This study concluded that HBM is effective in increasing nursing students' awareness regarding COVID-19. It also increases their perceived susceptibility, severity, and benefits. Besides, it may increase their self-efficacy to overcome perceived barriers to practice protective and preventive actions while dealing with COVID-19. *(Afr J Reprod Health 2020 (Special Edition); 24[2]: 78-86).*

Keywords: Awareness, COVID-19, Health belief model, Nursing students, Saudi Arabia

Résumé

Cette étude visait à étudier l'effet d'une intervention éducative basée sur le modèle de croyance en santé (HBM) à propos du COVID-19 sur la sensibilisation des étudiants en soins infirmiers et leurs croyances en matière de santé. Une conception de recherche véritablement expérimentale a été menée au collège d'infirmières de l'Université de Najran, en Arabie Saoudite. Un échantillonnage complet a été suivi pour inclure toutes les étudiantes des collèges (164 étudiantes). L'échantillon a été divisé au hasard en groupe d'intervention (82) et groupe témoin (82). L'intervention éducative a été conçue et menée sur la base du HBM à travers quatre phases séquentielles: évaluation, planification, mise en œuvre et évaluation. Les résultats de l'étude actuelle n'ont indiqué aucune différence statistiquement significative entre les groupes d'intervention et de contrôle concernant leurs caractéristiques démographiques, leur sensibilisation et leurs croyances en matière de santé avant l'intervention. Après l'intervention, des différences significatives (p <0,05) ont été observées entre les groupes d'intervention et de contrôle dans leur connaissance et toutes les constructions HBM concernant COVID19. Il y avait des corrélations positives et statistiquement significatives (P <0,05) entre le score HBM total des participants et leur score total de sensibilisation. Cette étude a conclu que HBM est efficace pour sensibiliser les étudiants en sciences infirmières au COVID-19. Cela augmente également leur sensibilité, leur gravité et leurs avantages perçus. En outre, cela peut augmenter leur efficacité personnelle pour surmonter les obstacles perçus à la pratique d'actions de protection et de prévention tout en traitant le COVID-19. *(Afr J Reprod Health 2020 (Special Edition); 24[2]:78-86).*

Mots-clés: Sensibilisation, COVID-19, modèle de croyance en matière de santé, étudiants en sciences infirmières, Arabie saoudite

Introduction

Coronavirus is a group of viruses with different genetic compositions infecting the respiratory system and known to be deadly at numerous outbreaks. Coronavirus infection causes numerous health problems ranging from the common cold to fatal pneumonia[1]. On December 31, 2019, WHO was alerted about the occurrence of several cases of severe pneumonia at Wuhan city, China, and mainly in the wet seafood market[2]. Later, on Jan 7, 2020, China government formally reported to WHO that they have an outbreak of new Coronavirus, which was named COVID-19[2]. According to WHO 160 situation report (June 28, 2020), COVID-19 infected 9 873 073 globally, with 495 760 deaths[3].There is sharp elevation in COVID-19 infection all over the world with many cases as in the western Pacific (213 032), Europe (2 656 437), Southeast Asia (735 854), Eastern Mediterranean (1 024 222), America (4 933 972) and Africa (278 815). The WHO risk assessment is very high. COVID-19 has spread very rapidly, creating panic all over the world[3]. For Saudi Arabia, the number of confirmed cases jumped to 186 463 cases, with 1 599 deaths. The death rate is 0.85%, which makes the government take numerous protective and preventive actions. The most affected KSA regions are Riyadh, Jeddah, Mecca, Dammam, Tabuk and Madena[4].

The WHO reported that COVID-19 has an incubation period of 7 to 14 days. During this incubation period, the person acts as a reservoir and can transmit the virus.[5] Anyway, COVID-19 is a type of coronaviruses, which are transmitted through droplet infection. Consequently, it can be transmitted through direct and indirect methods. Direct methods include close contact with oral secretions and breathing. Indirect ways include touching of instrument, surface, or objects that have been exposed to the droplet of an infected person[5,6]. COVID-19 droplets resulting from various respiratory supportive procedures such as a bronchoscope, oxygen therapy, and nebulizer, may be aerosolized and cause infections to others, including health care providers and nursing students[6].

WHO had issued a management guide to deal with COVID-19 mainly built on preventive measures and strict infection control precautions, including isolation. It incorporates precautions applied at triage, droplet precautions, contact precautions, and airborne precautions when performing aerosol-generating procedures[7]. Theses infection control precautions need awareness and experiences to be applied. Nursing students and intern nurses had minimal experiences when dealing with COVID-19. Some of them also may lack knowledge updates regarding emerging health problems[8]. At Najran University, nursing students begin clinical training at hospitals so early in second year of the program. Although nursing students learn infection control precautions, they did not perceive its importance (perceived benefits). They also may not imagine the risk imposed on them by exposure to COVID-19 infected persons (perceived susceptibility). Furthermore, they may not learn much about COVID-19 complications and prognosis (perceived severity) and the importance of preventive and protective measures (perceived benefits). Besides, they may not understand that the benefits of preventive and protective measures exceed any effort associated with its use (perceived barriers). Also, they should trust their abilities to overcome any barriers while practicing preventive and protective measures (self-efficacy). The health belief model is vital in changing risk factors and individual behaviors[9].

Health Belief Model (HBM) is a psychosocial model for behavior change. It is commonly used to describe the relationship between health beliefs and healthy behaviors. HBM assumes that the participation of individuals in the prevention, early detection, and treatment measures of a specific health problem depends on their perception that they are at risk of this a condition even if they do not suffer from symptoms (perceived susceptibility). They understand that this disease represents a significant health problem that can lead to serious complications (perceived severity); they believe in benefits of suggested preventive measures (perceived benefits) and recognize that the benefits exceed the expected barriers related to these measures (perceived barriers). Moreover, they believe that they have the motivation to engage in a healthy lifestyle and the capacity to perform

these protective behaviors (self-efficacy). Furthermore, HBM assumes that cues for action can act as behavioral stimuli that can be classified into internal and external cues. The internal cues as the history of the disease while the external cues as the media, and health team intervention which increases the engagement in such protective and preventive behavior[9,10].

This study aimed to assess nursing students' health beliefs, behaviors and attitude towards infection control precautions when dealing with patients and at any time. Furthermore, changing the health belief regarding the infectious disease's epidemic may deeply root the importance of self-updates in the field of nursing and medical sciences. The educational intervention content equipped them with the latest updates about COVID-19 reservoir, mode of transmission, signs/symptoms, and preventive/protective measures. Therefore, the current study investigated the effect of an educational intervention based on the HBM about COVID-19 on nursing students' awareness and health beliefs at Najran University, Najran, Saudi Arabia.

Methods

Design: True-experimental research.
Study participants: Comprehensive sampling was followed to include all female students at nursing college (164 students). Then the sample was randomly divided into intervention and control groups. The researchers obtained a sampling frame from student affairs at nursing college; then, a randomization bowl was used to assign the students in the intervention and control groups using a simple random sample.
Inclusion criteria: Saudi female nursing students, aged 18-25, accepted to participate in the study.
Setting: The study was conducted at nursing college, Najran University, Najran city is located in the southern region of KSA.

Tools of data collection:

Self-administered questionnaire: It was developed by the investigators after studying the related literature. It involves three main parts. Part I: Socio-demographic data, designed to collect data such as age, educational level residence, and mother's education. Part II: Assessment of nursing students' awareness regarding COVID-19: Researchers developed it after reviewing current literature. It included COVID-19 definition, signs and symptoms, risk factors, mode of transmission, diagnosis, prevention, management, World Health Organization recommendations, and related epidemiologic and statistical issues. Part III: Health belief model scale: To assess nursing students' health beliefs regarding COVID-19. Researchers developed it after reviewing current literature to examine perceived susceptibility (3 items), perceived severity (3 items), perceived barriers (3 items), perceived benefits (3 items), self-efficacy (4 items), and cues for action (4 items). In each item, the student has to choose one of five alternatives: strongly agree= 5, agree =4, indifference =3, don't agree =2 and strongly don't agree=1.

Instrument validity and reliability: The researchers developed the instrument, then it was tested for face, content, and construct validity by a jury of 5 experts in the nursing field. Instrument reliability was conducted using Cronbach's Alpha coefficient test (r=0.87).

Pilot Study: A pilot study conducted in 10% of the participants. The pilot study aims to ascertain the clarity and validity of the instruments. No instrument modifications were done based on pilot study results.

Data collection plan and educational intervention implementation:

For intervention group:

Because of health quarantine enforced to all Saudi populations at time of the COVID-19 pandemic, all the education was conducted online through blackboard system. The educational session was conducted through blackboard virtual classes with the assistance of all faculties in nursing college. The educational intervention was designed and conducted based on the HBM through four sequential phases: -
Assessment Phase: Assessment of students' awareness and health belief regarding COVID-19 through using the developed tools as an online pre-test. The results of the pre-test were analyzed to reveal students' training needs for COVID-19.

Planning phase: according to the results of needs assessment, and in the light of the relevant literature, the investigators designed an educational intervention in the form of (PowerPoint presentation and guide booklet based on HBM constructs), then it was independently evaluated by external peer reviewers. The educational intervention emphasized the areas of major deficiency in student' awareness and health beliefs about COVID-19.

Implementation phase: After program designing and approval taking, an online interviewing schedule through virtual blackboard classes was arranged with the collaboration with students. The educational program involved four sessions. The program was applied based on participants' readiness. Different teaching methods were used, such as presentation, group conversation, and problem-solving.

Evaluation phase: Follow up test was conducted after one month using the same pre-test tools for intervention groups. It was an online questionnaire.

For control group:

Online pre-test was conducted, then they were left for traditional sources of information as social media. After one month, an online post-test was conducted using the same pre-test format. After completion of the evaluation phase, the electronic educational materials were given to the control group to maximize the program benefits.

Data analysis:

After data collection was completed, it was entered SPSS version 23 to make the required analysis. Descriptive statistics as a number, percentage, mean ±SD was used to describe the data. Differences between the intervention and control groups were tested using chi-square, Fisher exact, and independent t-test. The Pearson's correlation coefficient was used to test the correlation between the continuous quantitative variables. P-value was considered significant at p≤ 0.05.

Results

Table 1 portrays that there are no statistically significant differences between intervention and control groups concerning their demographic characteristic. Therefore, the two groups are homogenous. Around three-quarters of the intervention (76.83%) and control (87.8%) groups are urban area residences. Furthermore, around half of intervention (50.0%) and control (56.1%) groups have monthly income less than 5000 SAR per month. Again, around one half of intervention (58.54%) and control (51.22%) groups have secondary school educated mothers. The mean academic level, age, and Grade Point Average (GPA) are 4.64±2.32, 21.86±1.99, and 3.12±2.1 for the intervention group compared to 4.05±2.09, 21.08±1.39, and 2.8±0.64 for the control group, respectively.

Table 2 illustrates that there are no statistically significant differences between intervention and control groups in all areas of awareness assessed before intervention. On the contrary, after the intervention, significant differences were observed between intervention and control groups in all areas of awareness assessed. As 91.5% of the intervention group had, good awareness compared to 3.0% among the control group after intervention. Besides, 64.6% of the control group had average awareness compared to 7.3% of the intervention group.

Table 3 shows that before the intervention, there are no statistically significant differences between intervention and control group concerning perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, self-efficacy, and total health beliefs (p<0.05). After intervention, there is a statistically significant difference between intervention and control groups in all elements of the health belief model and the total health beliefs score (p<0.05).

Table 4 illustrates that there were a positive statistically significant correlations (≤ 0.05) between participants' total HBM score and their total awareness score in both intervention and control groups before and after the Intervention.

Discussion

To date, the outbreak of COVID-19 is an emergency, and it is seen that health workers have an increased risk of infection. There are no studies found online that are concerned with the

Table 1: Socio-demographic Characteristics of Nursing Students at Najran University, Saudi Arabia (n=164)

Socio-demographic characteristics	Intervention group n= 82	%	Control group n= 82	%	Significance test	p-value
Residence					X^2=3.393	
Urban	63	76.83	72	87.80		0.650
Rural	19	23.17	10	12.20		
Monthly Income					FET=1.370	0.600
Less than 5000 SR per month	41	50.00	46	56.10		
From 5,000 to 10,000 SR per month	31	37.80	24	29.27		
More than 10,000 SR per month	10	12.20	12	14.63		
Mothers level of education					FET=4.546	0.109
University education	26	31.71	22	26.83		
Secondary education	48	58.54	42	51.22		
Read and write	8	9.76	18	21.95		
Academic Level (Mean ± SD)	4.64±2.32		4.05±2.09		t=1.96	0.093
Age (years) Mean ± SD	21.86±1.99		21.08±1.39		t=1.9	0.076
Grade Point Average (GPA) (Mean ± SD)	3.12±2.1		2.8±0.64		t=1.27	0.205

X^2: chi square test,   FET: Fisher exact test   t= Independent t-test

Table 2: Awareness score regarding COVID-19 between the intervention and control groups before and after the intervention (n= 164)

Area of awareness		Before intervention Intervention %	Control %	After intervention Intervention %	Control %
Definition	Correct	30.49	35.37	73.17	43.90
	Incomplete	37.80	37.80	19.51	50.00
	Incorrect	31.71	26.83	7.32	6.10
Significance test /p value		FET=0.643 P=0.717		FET=17.275 P=0.003*	
Signs and symptoms	Correct	34.15	40.24	84.15	42.68
	Incomplete	46.34	35.37	14.63	39.02
	Incorrect	19.51	24.39	1.22	18.29
Significance test /p value		FET=2.58 P=0.399		FET=46.76 P=0.000*	
Mode of transmission	Correct	4.88	3.66	78.05	10.98
	Incomplete	62.20	74.39	21.95	71.95
	Incorrect	32.93	21.95	0.00	17.07
Significance test/p value		FET=2.87 P=0.255		FET=84.825 P=0.000*	
High risk group	Correct	15.85	12.20	80.49	17.07
	Incomplete	53.66	52.44	19.51	73.17
	Incorrect	30.49	35.37	0.00	9.76
Significance test/ p value		FET=0.699 P=0.712		FET=71.46 P=0.000*	
Preventive methods	Correct	15.85	14.63	73.17	18.29
	Incomplete	70.73	74.39	26.83	81.71
	Incorrect	13.41	10.98	0.00	0.00
Significance test/p value		FET=0.350 P=0.880		FET=52.49 P=0.000*	
Infection control measures for COVID19 patients	Correct	8.54	4.88	86.59	23.17
	Incomplete	91.46	95.12	13.41	76.83
	Incorrect	0.00	0.00	0.00	0.00
Significance test/ p value		FET=0.877 P=0.346		FET=64.049 P=0.000*	
Total awareness	Good	2.4	0.0	91.5	3.0
	Average	30.5	32.9	7.3	64.6
	Poor	67.1	67.1	1.2	32.4
Significance test/ p value		FET=1.714 P= 0.553		FET= 172.149 P=0.000*	

FET: Fisher exact test,   *P significant at ≤0.05

Table 3: Health Belief Model (HBM) constructs scores between the intervention and control groups before and after the intervention (n= 164)

HBM Constructs (maximum score)	Before intervention				After intervention			
	Intervention group Mean ± SD	Control group Mean ± SD	Significance between groups t test	P value	Intervention group Mean ± SD	Control group Mean ± SD	Significance between groups t test	P value
Perceived susceptibility (15)	8.89 ±1.13	9.19 ±1.22	1.657	0.099	10.57 ±1.36	9.90 ±1.32	3.202	0.002*
Perceived severity (15)	9.51±1.51	9.42±1.47	0.365	0.715	12.60±1.60	9.53±1.70	11.861	0.000*
Perceived barriers (15)	11.37±2.03	11.21±2.22	0.476	0.635	6.53±2.00	10.67±2.60	11.393	0.000*
Perceived benefits (20)	15.17±2.52	15.85±2.51	1.736	0.084	16.84±2.50	15.02±2.76	4.415	0.000*
Cues to action (15)	9.96±2.94	9.67±2.38	0.591	0.555	11.35±2.72	9.47±2.34	4.730	0.000*
Self-efficacy (15)	12.47±2.34	12.59±2.05	0.354	0.724	13.67±1.75	12.17±2.53	4.406	0.000*
Total HBM score (80) #	56.01±6.31	56.74±6.15	0.751	0.451	65.04±7.66	56.10±6.42	8.91	0.000*

the total not included perceived barriers, *P significant at ≤0.05, t= Independent t test

Table 4: Correlation coefficient between participants' total HBM score and their total awareness score before and after the intervention (n=164)

Variables		Total health belief score			
		Intervention group		Control group	
		r	P	r	P
Total awareness score	**Before intervention**	0.393	0.005*	0.334	0.018*
	After intervention	0.404	0.004*	0.371	0.008*

r: Pearson correlation coefficient, *P significant at ≤0.05

application of HBM based interventions or any other types of educational intervention for health workers, or health college students towards COVID-19. Therefore, the current study was conducted to assess the effect of an educational intervention based on HBM about COVID-19 on nursing students' awareness and health beliefs.

In the present study, it worth mentioning that a large proportion of both groups initially had incomplete awareness regarding signs, mode of transmission, and preventive practice of COVID-19. This incomplete awareness may be attributed to the knowledge gained from social media. The present study showed that the HBM significantly improved the participants' awareness regarding COVID-19 after program implementation as most of the intervention group had good total awareness. This emphasizes the importance and efficiency of HBM in increasing participants' awareness regarding different health problems.

The results of the present study are in line with at least five other studies. First, Shi *et al.*, investigated the medical staff awareness and attitude toward COVID-19. They illustrated that around 90% of their participants had good awareness about COVID-19[11]. Second, Stirling *et al.*, applied an educational intervention about

MERS based on the health belief model for nursing college staff and students at Princess Nora University, KSA[12]. Their educational process depended on posters and videos provided by the Saudi Ministry of health, but they adjusted it to the health belief model. They found marked improvement in nursing students and staff awareness regarding MERS infection after the intervention. They also emphasized the importance of nursing college's actions to protect their students and staff at the time of epidemics[12]. Third, Alsulaiman and Rentner[13] investigated the effectiveness of the Saudi Ministry of health preventive measures for coronaviruses in the light of the HBM. They conducted their study at King Saud University on 875 participants to highlight the effectiveness of the HBM as a followed strategy at the Ministry of Health to increase public awareness regarding coronaviruses. They found that the educational measures based on HBM significantly increased students' awareness regarding coronaviruses. They further added that students who had high perceived benefits and low perceived barriers were more motivated to seek preventive practices and increase their awareness[13]. Fourth, Zhong *et al.*, conducted a rapid web-based cross-sectional study to evaluate

the Chinese population's attitude and awareness regarding COVID-19 at the peak of the epidemic; they reported that Chinese women were more knowledgeable and had optimistic attitudes than males. They further added that educational programs are an excellent tool to increase public awareness regarding COVID-19 and provide a more optimistic attitude. In addition, they reported that good awareness precipitate good preventive practices[14]. Fifth, CaricoJr *et al.*, investigated how the pharmacist can use HBM in communication with the public to increase their awareness regarding COVID-19. They reported that the formal communication system is not ready to deal with the COVID-19 pandemic, and therefore, the HBM may be an excellent tool to communicate with the public[15]. In the current study, HBM was used to internalize the infection control precautions and isolation when dealing with any infectious disease among nursing students.

Regarding the HBM constructs, the current study findings indicated a significant increase in the total HBM mean score in the intervention group compared to the control group after the intervention. This finding agrees with the previously discussed Carico *et al.*, study. They stated that HBM constructs could be arranged instantly to help strengthen COVID-19 restrictive behaviors, such as social distance and staying at home whenever possible. They further emphasized the importance of infection control measures in public places[16].

There were no studies found online that applied HBM educational intervention for COVID-19. Because it is a new emerging virus, it is the first study that assessed the effectiveness of HBM on nursing students' awareness and health beliefs regarding COVID-19. However, many studies have proven the effectiveness of HBM in reducing the burden of many diseases by changing people's behavior, increasing awareness, and preventive practice. In this regard, Abd El Aziz *et al.*, applied HBM based intervention to evaluate its effect on pregnant women's awareness and health belief regarding urogenital infection. They emphasized the effectiveness of the HBM application in improving pregnant women's health beliefs to prevent the occurrence and recurrence of urogenital infections[17].

Furthermore, Mahmoud *et al.*, applied the HBM based intervention to improve breast self-examination performance and breast cancer awareness and health belief among university students. They concluded that the intervention based on HBM is an effective method to enhance the practice of breast self-examination in girls and improve their awareness and health beliefs regarding breast cancer[18]. Additionally, Zeigheimat *et al.*, investigated the effect of HBM-based intervention on the health behaviors of staff nurses in nosocomial infection control. The study reported that the application of HBM could enhance perceived susceptibility and perceived benefits, decrease the perceived barriers, and improve nosocomial infection control among the studied participants[19].

The present study Illustrated that there are positive, statistically significant correlations between participants' total HBM score and their total awareness score in both intervention and control groups before and after the intervention. This result seems to be logical because if the awareness increased, the perceived susceptibility, severity, benefits, cues of actions, and self-efficacy to overcome the barriers to prevent diseases would also be increased.

This result is in line with Guidry *et al.*, who investigated the application of the HBM in public communication during Zika virus infection. They concluded that any person would never take or engage in any preventive or protective action without enough information to increase their sense of susceptibility and severity. Besides, enough awareness will help to remove barriers and the benefits of taking preventive actions[20]. Also, Guzman studied the relationship between HBM and the level of awareness among cardiac patients. They concluded a statistically significant relationship between the level of participant awareness and their total health beliefs and its construct[21]. Furthermore, the previously mentioned Alsulaiman and Rentner elaborated that increasing awareness will help to increase public perceived susceptibility and severity from being infected with a deadly virus. It will also help increase the sense of perceived benefits and overcome perceived barriers to preventive and protective actions[13].

Strengths and Implication of the Study

This study addresses an important issue relating to COVID-19. Data generated from this study may help decision-makers to build their educational intervention about COVID-19 based on HBM. HBM may make the educational process more effective. Therefore, it needs to be added in nursing educational curricula and to be applied by nursing educators to change nursing students' health beliefs regarding essential topics like infection control and isolation for different infectious diseases.

Limitation of the Study

This study needs to be replicated in different setting and a larger population to be able to generalize the results.

Ethical Approval

After approval of the research proposal by the deanship of scientific research, it was reviewed by Najran University ethical review panel. A formal approval to carry out the study was obtained from the nursing college Dean to conduct the study after an explanation of its objectives. Informed consent was taken from each student. All data was confidential and was used for the research purpose only. Moreover, the students were informed that they had the right to withdraw from the study without any penalties.

Conclusion

Based on the study results, it can be concluded that the HBM is effective in increasing nursing students' awareness regarding COVID-19. It also may increase their perceived susceptibility, severity, and benefits from COVID-19 prevention. It may also increase their self-efficacy to overcome perceived barriers to practice protective and preventive actions while dealing with COVID-19. There are also significant relations found between total students' awareness and their health beliefs.

Acknowledgments

Consent for Publications

The authors have read and approve the publication of the manuscript in its current form. This manuscript has not been submitted for publication elsewhere and has not been previously published.

Competing Interests

The authors declare they have no conflict of interest.

Authors' Contributions

Elgzar conceived the initial idea, wrote the initial stage of the manuscript, and discussed findings. *Al-Qahtani* reviewed literature and contributed intellectually. *Elfeki* participated in data collection and contributed to the scientific background, and *Ibrahim* collected data, make statistical analysis, and wrote the initial draft. All authors agree on the current version of the manuscript.

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