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Effect of education based on the protection motivation theory on the promotion of protective behaviors in medical laboratories' staff in Yazd, Iran

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Abstract

Objectives: The aim of this study was to investigate the effect of education based on the protection motivation theory (PMT) on the promotion of protective behaviors in medical laboratories' staff in Yazd, Iran.

Methods: This interventional study utilized a census method to survey 90 stafffrom medical laboratories. Data were collected in two stages, before and after the intervention, using a researcher-made questionnaire with confirmed validity and reliability that administered through self-reporting. The questionnaire consisted of demographic information, as well as the constructs of PMT (91 items) and protective behavior (20 items). Following the pre-test, the intervention consisted of six one-hour sessions. The same questionnaires were completed three months after the education.

Results: Following the education, there was a significant increase in the constructs scores of perceived vulnerabilities (approximately 4 units), perceived self-efficacy (approximately 2 units), fear (approximately 3 units), protection motivation (approximately 3 units), and protective behavior (approximately 6 units) among the medical laboratory personnel. However, there were no significant differences observed in the constructs of perceived severity, response efficiency, response cost, and perceived reward before and after the intervention.

Conclusion: Intervention interventions aimed at promoting protective behaviors can effectively help reduce laboratory hazards, particularly by focusing on increasing protection motivation. Therefore, the protection motivation theory can serve as a valuable framework for the development of education programs to enhance protective behaviors in medical laboratories.

Keywords: Medical Laboratories, Protective Behavior, Protective Motivation Theory (PMT), Education.

Introduction

The medical diagnostic laboratory (MDL) poses potential hazards that can lead to both financial and life-threatening consequences if safety and health issues are not given adequate attention. Due to the complexity of tasks and the presence of specialized staff in various fields, the MDL is a highly sensitive and vulnerable work environment.[1]

Among the numerous risks faced by healthcare personnel, particularly those working in MDLs, exposure to biological agents and subsequent infections is one of the most common occupational threats.[2] According to World Health Organization (WHO) statistics, approximately 40% of hepatitis B, hepatitis C, and acquired immunodeficiency syndrome (AIDS) cases among healthcare workers worldwide are a result of occupational contacts and needle stick injuries.[3]

The transmission of diseases through contact with contaminated blood or blood products can occur without being noticed due to their imperceptibility on the skin or mucous membranes. A study conducted in the United States revealed that 3% of serum or plasma samples sent to teaching hospital laboratories tested positive for human

immunodeficiency virus (HIV) antibody.[4] In addition to exposure to infectious agents, MDL staff are also at risk of being exposed to hazardous chemicals. Therefore, it is crucial for these individuals to possess knowledge regarding the toxic effects of these chemicals, as well as the methods of exposure and injuries, in order to prevent or minimize potential incidents.[5]

In this particular setting, every individual bears the responsibility not only for safeguarding their own well-being but also for ensuring the safety and protection of others. To establish a comprehensive education program that effectively promotes safety and mitigates injuries resulting from accidents, various theories or models of health education can be employed at the individual, interpersonal, and social levels. One such theory is the Protection Motivation Theory (PMT), which has been utilized to examine the factors influencing an individual's motivation and subsequent behavioral choices. Originally formulated by Rogers in 1975, this theory aims to clarify the impact of fear on health-related attitudes and behaviors. According to this particular theory, it is postulated that the decision to adopt protective behavior as recommended is contingent upon the individual's personal drive to safeguard themselves.[6,7]

PMT serves as a valuable framework for crafting messages within the realm of diverse preventive behaviors. These behaviors encompass the utilization of protective aids among factory workers, promoting the importance of screenings for different types of cancer, enhancing patient adherence to treatment plans, fostering the adoption of healthy nutritional habits, and encouraging preventive measures against AIDS.[7-9]

Given the increasing number of MDLs in developing nations such as Iran, coupled with the limited knowledge regarding protective practices among MDL staff, particularly those with minimal work experience, the prevalence of occupational accidents in MDLs is alarmingly high.[10,11] Moreover, previous studies conducted in this area lacked a theoretical framework.

Objectives

This present study was conducted to investigate the effect of education based on the PMT on the promotion of protective behaviors in medical laboratories' staff in Yazd city, Iran.

Methods

This interventional study, conducted in the MDLs of Yazd city, located in the central region of Iran, followed a before and after design. The study involved the participation of 125 technical staff from 4 public sector MDLs, who were selected through a consensus method. However, the number of participants decreased to 90 due to non-cooperation, which included failure to complete the questionnaire or attend the education intervention. The technical staff with positive hepatitis B antibody titers, failure to attend all education sessions, and lack of consent were excluded from the study.

The questionnaire developed by the researcher consisted of three parts: demographic and background characteristics, protection motivation theory (PMT), and behavior. The demographic and background characteristics section included questions about age, gender, marital status, level of education, field of study, and work experience. The PMT section comprised 14 items on perceived vulnerability, 8 items on perceived severity, 13 items on response efficacy, 12 items on perceived self-efficacy, 10 items on response cost, 8 items on fear, 11 items on perceived reward, and 15 items on protection motivation. The behavior section consisted of 20 items. The validity and reliability of the questionnaire were determined confirmed by the Content Validity Ratio (CVR), Content Validity Index (CVI), and Impact Score (IS). The answers to the constructs of PMT were scored using a 5-point Likert scale, while the behavior was scored from always (score 0) to never (score 3). The questionnaire's reliability was established by measuring the internal correlation of the variables using Cronbach's alpha coefficient, as shown in Table 1.

Data collection

Initially, the MDLs' staff were provided with necessary explanations regarding the study objectives and the voluntary nature of their participation. Subsequently, in the pre-test phase and prior to the intervention, the staff completed a researcher-made questionnaire to assess their protective behaviors and the factors influencing these behaviors based on PMT. Following this, the education content was delivered to the staff. After three months, the protective behavior and other variables were re-evaluated using the same questionnaire to determine the impact of the intervention. The staff of MDLs completed the questionnaires through self-reporting.

Education intervention

The education content was developed and designed based on the initial needs assessment, incorporating the input of expert panel members such as health education specialists, MDL experts, and pathologists [Table 2]. This education was delivered to the staff through six one-hour sessions, utilizing lectures, film screenings, educational booklets, and audiovisual files prepared by laboratory experts.

Table 1. Cronbach's alpha coefficient, impact score, content validity index, and content validity ratio of the constructs of PMT

Variable	Cronbach's alpha coefficient	Impact score	Content validity index	Content validity ratio
Perceived vulnerability	0.82	4.31	0.97	0.88
Perceived severity	0.9	4.58	0.96	0.96
Response efficacy	0.82	4.23	0.98	0.9
Perceived self-efficacy	0.89	4.49	0.97	0.89
Response cost	0.91	4.71	0.97	0.89
Fear	0.65	4.61	0.97	0.92
Perceived reward	0.89	4.59	0.96	0.89
Protection motivation	0.93	4.78	0.99	0.91
Behavior	0.89	4.38	0.99	0.97

Table 2. Education intervention according to the constructs of PMT

Outlines	Education content	Teaching methods and materials
Perceived vulnerability	To enhance susceptibility to laboratory hazards, emphasis was placed on the following aspects: Illustrating instances of injuries in various scenarios, encompassing diverse working conditions, age groups, and levels of work experience. Prohibiting the entry of children, family members, and other individuals into the potentially contaminated laboratory environment Encouraging the prompt reporting of contaminations to the manager and other staff members.	Lecture, question and answer
Response cost	To minimize the expenses associated with the implementation of staff protective measures, namely the time and financial costs incurred for treating injuries resulting from the neglect of such measures, the following aspects were highlighted: The expenditure of time and resources for carrying out protective behaviors, such as timely vaccination against contagious diseases (e.g., hepatitis B), is significantly lower compared to the costs involved in treating infectious diseases and their subsequent complications (including laboratory hazards).	Lecture, question and answer, indirect education including the distribution of educational pamphlets
Perceived reward	The staff contemplates both intrinsic and extrinsic rewards when they choose not to adhere to protective behavior. These rewards include the desire to feel at ease and escape from reality, as well as the act of denying the situation. These rewards have a purely psychological nature, and it is important to address relevant psychological subjects in order to eliminate them.	Lecture, question and answer, indirect education including the distribution of educational pamphlets
Response efficiency	In order to enhance comprehension regarding the efficacy of protective measures, the subsequent remedies were proposed: Highlighting the significance and responsibility of adhering to customary protective measures in laboratory settings, such as donning gowns, gloves, and protective eyewear. Illustrating instances of individuals who have suffered adverse outcomes due to non-compliance with protective measures.	Lecture, question and answer, indirect education including distribution of educational pamphlets, and videos
Fear	To enhance the potential risks and hazards associated with laboratory work, as well as to motivate them to adopt protective measures, the following measures were proposed: Disseminating information pertaining to laboratory risks and the potential repercussions of non-compliance with health and safety standards in laboratory settings. Displaying visual aids such as images and videos of laboratory personnel who have suffered from injuries or illnesses, including HIV, as a result of not adhering to safety protocols	Lecture, question and answer, indirect education including distribution of educational pamphlets, and videos
Protective behavior	To enhanceappropriate protective measures, the subsequent aspects were considered: Familiarizing individuals with the optimal timing for administering vaccinations and assessing antibody levels against contagious ailments Educating individuals on the accurate technique for washing and sanitizing hands	Lecture, question and answer, indirect education including distribution of

	Providing information on hazardous contaminants and the proper procedure for documenting them Demonstrating the correct approach for disinfecting contaminated materials and work surfaces	educational pamphlets, and videos

Statistical analysis

The data were analyzed using SPSS-21. As the data exhibited a normal distribution, the parametric paired t-test was employed to compare the data before and after the intervention. The continuous variables were expressed as the mean ± SD, and the categorical variables were presented as a percentage and frequency. A "P-value" less than 0.05 was considered significant.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. The participants were provided with a clear explanation regarding the confidentiality of their data and the purpose of the study. It is important to note that all individuals voluntarily enrolled in the study. Furthermore, this study received approval from the ethics committee, with the assigned code IR.SSU.SPH.REC.1395.17.

Results

The mean age of participants was found to be 34.3±8.9 years. The majority of the participants consisted of women, accounting for 63.3% of the total staff. Furthermore, 80% of the employees were married. It was observed that two-thirds of the staff, equivalent to 66.7%, held a bachelor's degree. Additionally, approximately 90% of the employees possessed a degree in laboratory science, while 57% of them had rotational shifts, as indicated in Table 3.

Table 3. Demographic characteristics of MDL staff

Variables		N (%)
Sex	Male	33 (36.7)
	Female	57 (63.3)
Marital status	Single	18 (20)
	Married	72 (80)
Education level	Associate Degree	12 (13.3)
	Bachelor's degree	60 (66.7)
	Master's degree	18 (20)
Field of Study	Laboratory sciences	81 (90)
	Clinical Biochemistry	9 (10)
Shift work	Fixed	33 (36.7)
	In circulation	57 (63.3)

Following the intervention there was a significant ($p<0.05$) increase in the constructs of perceived vulnerability (approximately 4 units), perceived self-efficacy (approximately 2 units), fear (approximately 3 units), protection motivation (approximately 3 units), and protective behavior (approximately 6 units) among the laboratory staff. However, no significant difference was observed in the constructs of perceived severity, response efficiency, response cost, and perceived reward before and after the intervention, as indicated in Table 4.

Table 4. Mean PMT construct scores before and after the intervention in MLDs' staff

Variable	Before	After	The mean percentage of the maximum score before the intervention	The mean percentage of the maximum score after the intervention	P Value
Perceived vulnerability	60.47±4.42	64.28±3.91	80.38	91.83	0.001
Perceived severity	35.68±3.47	36.1±3.11	89.2	90.25	0.50
Response efficiency	56.94±5.05	56.65±5.01	87.6	87.15	0.60
Perceived self-efficacy	50.44±5.44	52.57±5.42	84.06	87.62	0.011
Response cost	18.89±5.18	18.17±4.31	37.78	36.34	0.39
Fear	31.83±4.17	34.22±3.65	79.57	85.55	0.0001
Perceived reward	22.39±7.03	21.6±5.49	40.71	39.27	0.53
Protection motivation	67.19±6.7	70.3±5.27	89.59	93.73	0.001
Behavior	45.16±7.67	51.72±5.95	75.27	86.2	0.0001

Discussion

To prevent infections transmitted through occupational contacts and chemical and physical hazards in MDLs, it is crucial to provide staff with proper education and implement preventive measures. The success of these measures is contingent upon the staff's comprehension of biosafety conditions, adherence to standard precautions, and adoption of preventive behaviors.[12] so, this study was

conducted in Yazd, Iran, to evaluate the impact of PMT-based education on the promotion of protective behaviors among MDL staff.

Previous research has demonstrated the effectiveness of PMT in promoting prevention and protection behaviors, further supporting the use of this theory in education programs.[13,14] In the current investigation, the meanlevel of protection motivation among MDLs' staff experienced a significant increase of 3 units following the implementation of the education intervention. It is important to note that behavior is influenced by intention, because without intention the desired behavior is unlikely to occur. Therefore, a strong intention can have a positive impact on promoting protective behavior among the staff. The mean level of protection motivation (intention) showed a considerable rise in various studies. For instance, McClendon's study[15] on reducing the risk of skin cancer reported an increase of 7.9 units in protection motivation. Similarly, Masoudi's study[16] on protective behaviors against the harmful effects of sunlight observed a rise of 1.62 units. Additionally, Dehdari's study[17] on the education intervention based on PMT and the intention to perform a pap smear demonstrated an increase of 0.75 units. Comparing these results with the present study suggests that PMT was effective in increasing behavioral intention, highlighting the relative impact of the education intervention on staff.

The current investigation observed a noteworthy increase in mean the staff's perceived vulnerability and perceived severity regarding the execution of protective behaviors aftereducation. This finding suggests that the education programs had a positive impact on the staffswho participated in the intervention. Perceived vulnerability refers to an individual's belief in their susceptibility to a threat.[18] Similarly, prior research by McClendon et al.,[15] Masoudi et al.,[16] and Dehdari et al.,[17] found that the PMT-based education intervention increased perceived vulnerability and severity.

The intervention resulted in a mean increase of 3 units in the fear construct,. In contrast, Masoudi et al.,[16] reported a rise of only 1 unit, while Dehdari's[17] study showed a minimal increase of 0.06 units in the mean of fear. This indicates that the fear perception in the present study was higher than in the other two studies, possibly due to the specific techniques used to address the fear construct in the intervention. Fear, in this context, refers to concern about the occurrence of a disease or its consequences. It is impacted by perceived vulnerability and severity, with higher levels of both causing more anxiety and concern about the threat. This, in turn, can positively impact the intention and performance of protective behavior.[18-20] In the current study, we found a 2-unit increase in mean perceived self-efficacy, which is consistent with previous studies, confirming the improved impact of the approaches used in this intervention.[15-17]

there was a mean increase of 6 units in protective behavior, which is a significant improvement. This suggests that the education sessions had a positive impact on promoting protective behaviors among staff as well as increasing their intention to perform such behaviors. These results are consistent with previous studies that have reported similar increases in protective behaviors. The success of this intervention may be attributed to its theory-based approach and the use of specific and effective techniques for each construct during education.[15-17]

Based on the efficacy of the constructs employed in this investigation to encourage protective behaviors among MLDs' personnel, it is recommended that education programs be established for healthcare staff or vulnerable groups to promote protective behaviors. The findings revealed that certain constructs, including response cost, response efficiency, perceived reward, and perceived severity, did not exhibit a significant increase despite the intervention. It is important to note that our study did not allow for modifications to the laboratory setting to reduce costs, and obtaining information on the usefulness of protective behaviors and the reduction of mental rewards necessitates a more extensive study.

One of the limitations encountered in this study pertained to the method of data collection, which relied on self-reporting. Additionally, due to the demanding and rotating nature of their shifts, not all members of the staff were able to attend and actively participate in the education sessions. Furthermore, the current study had other limitations, such as the absence of sampling from private laboratories and the relatively small size of the population under investigation.

Conclusions

The implementation of education intervention utilizing the Protection Motivation Theory (PMT) proved to be effective in promoting protective behaviors among the staff of MDLs. This study demonstrated the significance of perceived vulnerability, perceived self-efficacy, fear, and protection motivation in influencing the adoption of protective behaviors aimed at preventing hazards. Therefore, these constructs can serve as a foundation for the development of education programs that aim to facilitate protective behaviors in MDLs.

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Competing interests

The authors declare that they have no competing interests.

Abbreviations

Protection Motivation Theory: PMT; medical diagnostic laboratory: MDL; World Health Organization: WHO; acquired immunodeficiency syndrome: AIDS; human immunodeficiency virus: HIV; Content Validity Ratio: CVR; Content Validity Index: CVI; Impact Score: IS.

Authors' contributions

All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Institutional Review Board approval (code: IR.SSU.SPH.REC.1395.17) was obtained.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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