Mansoura Nursing Journal (MNJ)

vol.6. No.2 - 2019

EFFECT OF WEB-BASED COURSE ON KNOWLEDGE AND ATTITUDE OF HEALTH CARE PROFESSIONALS IN RELATION TO BLOOD BORNE PATHOGENS

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Abstract

Background: Healthcare professional, is an individual who provides preventive, curative, promotional or rehabilitative health care services to people, families or communities. Exposure to blood borne pathogens (HIV, hepatitis B, hepatitis C) poses a serious risk to them. Education is a major component of prevention strategies to reduce the risk of occupational transmission of blood-borne pathogens to health care personnel. Web based learning is increasingly being adopted in health professionals' education. Therefore, this study aimed at assesses the effect of Web-based Course on Knowledge and Attitude of Health care Professionals in relation to Blood borne Pathogens. It has been carried out using a quasi-experimental research design. The subjects were constituted of 62 health-care professionals including (doctor, nurses, dentist, and lab technicians who have bachelor degree and higher. In order to collect the necessary information for this study; online self-administered questionnaires was used. There was a statistical significant difference in mean scores of knowledge, and attitude of health-care professionals pre and post web-based blood borne course ($P<0.05$). **Conclusion:** it is concluded that, web based leaning can effectively improve healthcare professionals' knowledge, and attitude toward blood-borne pathogens.

Keywords: Healthcare professional; Blood borne pathogens; Web based learning**.**

Introduction

A healthcare professional, is an individual who provides preventive, curative, promotional or rehabilitative health care services in a systematic way to people, families or communities [1].

Worldwide, the healthcare workforce represents 12% of the working population. Healthcare workers operate in an environment that is considered one of the most hazardous occupational settings. In addition to the usual workplace related exposures, healthcare professionals encounter diverse hazards due to their work related activities [2].

They are at particular risk for occupational exposure to blood borne pathogens, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).

In a health care setting, accidental transmissions of BBPs occur as a result of exposing the skin and mucous membrane to blood and other potentially infectious body fluids; through needle sticks or cuts from other sharp contaminated instruments [3].

The World Health Organization (WHO) estimated that each year, among the 35 million health care workers (HCWs) worldwide, approximately 3 million experience percutaneous exposure to blood-borne pathogens (2 million to HBV, 0.9 million to HCV, and 170,000 to

HIV). These injuries result in 70,000 HBV infections, 15,000 HCV infections, and 500 HIV infections [4].

Occupational exposure to agents that cause these infections is linked to the fear and prejudice present among health care workers. This fact may make some of the healthcare professionals neglect the health risks in their workplaces and make others looking for continuing education [5].

So, educational programs are extremely important for healthcare professionals (HCPs) and are among the major components of prevention and control strategies [6]. But traditional teaching approaches have shown their limitations in healthcare professional education because there are difficulties for employed healthcare professionals to follow regular education procedures. Therefore, globally, web-based education has gained new ground as instructional methods replacing or supplementing traditional education [7].

Web-based learning is defined as one teaching strategy 'in which the web is used to provide the materials and interactions between the students and teachers'. Comparing to the traditional classroom or clinic-based approaches to provide continuing professional education, Web-based learning or online learning is advocated as an efficient platform for rapid dissemination of knowledge to healthcare providers [8].

Thus it is deemed necessary to conduct this study to assess the effect of web-based course on knowledge and attitude of health care professionals in relation to blood borne pathogens

Aim of the study:

To assess the Effect of Web-based Course on Knowledge and Attitude of Health care Professionals in relation to Blood borne Pathogens)

Subjects and Method

Design:

A quasi experimental design was followed in this study.

Setting:

The study was carried out at World Wide Web (WWW) for globalization.

Subjects and sampling:-

Subjects:

Study subjects were recruited from health-care professionals including (doctor, nurses, dentist, and lab technicians who have bachelor degree and higher).

Sampling:

Sample size:-

Sample size for two proportions calculated by assuming α level to equal 0.05, β error equal 0.1 and the desired power is 90%, when the assumed that the proportion of nurses with improved knowledge and practice would be increased from 34% to 76% according to reviewed literatures [9]. The minimum required subjects by considering dropouts by adding 10% are 62 health-care professionals, [10].

Sampling technique:

Convenience sampling technique was used to recruit the study subjects.

Tools for data collection:

After reviewing the relevant literature three online self-administered questionnaires were used in this study for data collection.

1. **Occupational data assessment questionnaire:** This tool was developed by the researcher to assess the occupational characteristics of healthcare professionals. It included questions about age, gender, occupation/ job categories, qualification, years of experience, exposure to needle stick injuries or

blood splash during the past 3 months, previous blood screening for HIV, HCV, and HBV as well as history of HBV immunization. Also it included questions about receiving previous training courses concerning blood-borne pathogens, infection control practices, and d standard precaution.

2. **Online knowledge assessment questionnaire about blood-borne Pathogens:** the tool was developed by the researcher to assess knowledge level of healthcare professionals regarding blood-borne pathogens. It classified into 5 main categories (overview about blood borne pathogens, hepatitis B virus, hepatitis C virus, human immune deficiency virus, and prevention of blood borne pathogens) , these categories are composed of 52 questions (37 multiple choice and 15 true or false questions) one mark awarded for each correct response. The total scores is divided into three levels; poor level = less than 50% of total scores (less than 62), fair level= 50% to 65% of total scores (62- less than 80.6), good level= more than 65% of total scores (more than 80.6).
3. **Online attitude assessment questionnaire toward blood-borne pathogens:** this tool was developed by the researcher to assess the attitude of healthcare professionals toward blood-borne pathogens and standard precautions. This tool was used prior to starting the educational sessions and, after finishing. It consists of 22 statements requiring a response on 4 point Likert- rating scale with 4 continuum (strongly agree, agree, disagree, strongly disagree). A scoring system was used to quantify the healthcare professionals' attitude, 4 marks was given to strongly agree, 3 marks to agree, 2 marks to disagree and 1 to strongly disagree which made up a total score of 88 mark.

Method:

This study was accomplished throughout two main phases:

Phase I: Preparatory phase

1- **Administrative process (Ethical considerations)**

- An ethical approval was obtained from the Faculty of Nursing Research Ethics Committee (FNREC)/ Mansoura University to conduct the study.
- Informed consent was obtained from the health care professionals to participate in the study after clarifying the aim of the study and ensuring confidentiality of data.

2- **Literature review:**

A review of local and international literature was carried out on the various aspects of web based blood-borne pathogens education using scientific published articles, internet search, and textbooks.

3- **Developing of the study tools:**

Tools were developed by the researcher based on reviewing the relevant literature. Validity of the developed tools was tested by the following: Content validity by submitting the tools to a jury of 5 experts in the field of "community health nursing". Face validity by conducting a pilot study on 10% of study sample (n= 6). Reliability for the attitude scale was done by using Cronbach's alpha and the result was 0.85. Based on the collected information, the necessary modifications were done, some questions were added, and others were clarified or omitted.

4- **Development of web based education sessions**

1. It was developed by using set of technical and instructional standards

that were developed by web based design team.

2. The researcher with the web based design team was selecting a learning platform which provides participants with an access to information, tools, and resources to support education delivery and management through the internet about blood borne pathogens and its prevention.
3. The main screen was designed to show the site map and to provide access to education sessions, discussions, and links. Post-learning discussion and comments were designed to solicit users' impressions of the learning experience and facilitate interface. In addition, the main menu always appears on the upper bar so that the user can select a different menu easily.
4. Navigation of the sessions was sequential from session 1 to session 5 and no session could be skipped. Within each session, the learners had the choice to advance to the next screen, replay the current screen, or go back to the previous screen. The learners were afforded as much time as they wanted to process the information on each screen.
5. The content of module was developed by the researcher; it was arranged at six sessions and covers the following topics "overview of blood borne pathogens, hepatitis B virus, hepatitis C virus, human Immunodeficiency virus, prevention of blood borne pathogens, and personal protective equipment". It was classified into texts, images, and video & audio **Figure (1)**. The produced content was uploaded on the web site by the researcher (**www.research.thehealthgardens.com**)

Phase II: Operational phase

Stage 1: Announcement for the web site

The web site Announcement was done through posting a face- book posts during the period from 1 to 10 July 2017 **https://www.facebook.com/thehealthgardens/photos/a.150513238694492.1073741828.149964528749363/150521262027023/?type=3&theater**

Stage 2:- Initial data collection

1. After logging into the web site, each participant was required to sign a consent form and create an account with a private password.
2. All participants were asked to complete the pre- online self-administered questionnaires that were uploaded on the web site. Initial data was assessed their occupational characteristics, their knowledge about blood borne pathogens, and their attitude toward blood borne pathogens and standard precaution by using tools number (I, II, III) to measure the level of improvement in their knowledge, and attitude after completion of web based course.

Stage 3: Implementing web-based sessions

1. All participants who completed the pre- online self-administered questionnaires were asked to complete the web based course.
2. Participants were given a time to complete the course and were allowed to log onto the course as many times as needed to complete all sessions and the evaluation stated from July up to December.
3. All questions raised by the participants were answered and they are provided with feedback through chatting on website.

Stage 4: Evaluation of the course.

1. Participants were evaluated for their knowledge and attitude about blood borne pathogens through the online self-structured questionnaire on the website (Tool II& Tool III**).**

Statistical analysis:

Data was sorted, coded, organized, categorized and then transferred into especially designed formats. Analysis performed using SPSS (Stands for Statistical Product and Service Solutions) version 20.0. Data were presented by using descriptive statistics in the form of frequencies and percentage. Arithmetic mean ± standard deviation for continuous variables and percentages for categorical variables. T test was used for comparison between 2 paired within one group. ANOVA test was used for comparison between and within groups. P< 0.05 was considered to be statistically significant. Pearson correlation coefficients were used estimate correlation between the study variable to clarify positive or negative correlation .

Results:

Box (1) displays the components of web-based blood borne course by using English language. It was started with a brief introduction about the burden of occupational exposure of healthcare professionals to blood borne pathogens and the required actions to reduce exposure risk. The general goal of the course aimed at providing healthcare professionals with required knowledge and skills regarding prevention of blood borne pathogens. The content was arranged at six sessions as the following: overview of blood borne pathogens, hepatitis B virus, hepatitis C virus, human Immunodeficiency virus, prevention of blood borne pathogens, and personal protective equipment. Audiovisual media in forms of pictures and videos were used to facilitate knowledge transformation. The web-based course was uploaded on website "www.research.thehealthgardens.com".

Table (1) portrays the distribution of healthcare professionals (HCPs) according to their occupational characteristics. The mean age of healthcare professionals was 29.09±6.5 years. More than half of them 54.8% are females. Regarding to their occupation 72.6% are nurses, 14.5% are physicians, 8.1% are lab technicians, and 4.8 % are dentists. Moreover, 25.8% of them are working in medical department. Most of HCPs 79.1% have a bachelor's degree. More than one third of them 38.7% had experience from one to five years. Concerning training courses, 75.8% and 54.8% of HCPs did not attend training courses about blood borne diseases and infection control respectively.

Table (2) presents the distribution of HCPs according to their history of exposure to needle sticks, screening of blood borne viruses and vaccination against HBV. It was observed that 46.8% of HCP did not expose to needle sticks or blood splashes during the last three months. Regarding previous blood screening for blood borne viruses, it was found that 45.2%, 67.7%, and 79.0% of HCPs did blood screening of HIV, HBV, and HCV respectively. It was observed that 38.7% of them received three doses of HBV vaccine.

Table (3) illustrates the distribution of the healthcare professionals (HCPs) according to their level of knowledge regarding blood borne pathogens pre and

post web-based course. It was observed that 29.0% of HCP showed good score level of knowledge with a mean of 5.54±2.74 marks related to overview about blood borne pathogens before completion of web-based course. However, post web-based course, 93.5% of them showed good score level of knowledge with a mean of 9.50±1.23 marks. The difference was significant between pre and posttest regarding the previous item.

In relation to hepatitis B virus, 8.1% of HCPs showed good score level of knowledge with a mean of 12.43±6.16 marks before completion of web-based course. However, post web-based course 100.0% of them showed good score level of knowledge with a mean of 23.46±1.79 marks. The difference was significant between pre and posttest regarding the previous item. Concerning hepatitis C virus, 1.6% of HCPs showed good score level of knowledge with a mean of 14.22±4.93 marks before completion of web-based course. However, post web-based course 96.8% of them showed good score level of knowledge with a mean of 26.96±2.46 marks. The difference was significant between pre and posttest regarding the previous item.

Regarding human immune deficiency virus (HIV), it was noticed that 4.8% of HCPs showed good score level of knowledge with a mean of 10.62±3.72 marks before completion of web-based course. However, post web-based course 95.2% of them showed good score level of knowledge with a mean of 20.19±2.24 marks. The difference was significant between pre and posttest regarding the previous item.

As regards to prevention of blood borne pathogens, 14.5% of HCPs showed good score level of knowledge with a mean of 11.00±4.33 marks before completion of web-based course. However, post web-based course 80.6% of them showed good score level of knowledge with a mean of 15.67±4.14 marks. The difference was significant between pre and posttest regarding the previous item.

Overall, total knowledge scores revealed that 9.7% of HCPs showed good score level of knowledge with a mean of 53.82±18.50 marks before completion of web-based course. However, post web-based course 91.9% of them showed good score level of knowledge with a mean of 95.81±7.45 marks. The difference was significant between pre and posttest regarding the previous item.

Table (4) shows the mean difference between knowledge categories as well as total knowledge pre and post web-based course. The results revealed significant differences between pre and post-test. The total knowledge score was increased by 77.9 % after completion of web-based course. The difference was significant between pre and post-test.

Table (5) presents mean difference between attitude categories and total attitude pre and post web-based session. It was observed that there was significant differences between pre and post in relation to attitude toward blood borne diseases with a mean of 33.98(2.86) before completion of web-based sessions compared to 42.09(2.53) post web-based sessions. Regarding attitude toward standard precautions, there was significant differences between pre and post with a mean of 21.06(3.19) before completion of web-based sessions compared to 22.75(1.47) post web-based sessions.

Overall, total attitude score revealed that, there was significant differences between pre and post with a mean of 55.04 (4.32) before completion of web-based

sessions compared to 64.85 (3.09) post web-based sessions.

Discussion:

Healthcare professionals (HCPs) who are employed in different health care settings represent a vital workforce that aims to preserve and improve the health of others [11]. However, they are confronted by numerous occupational hazards particular risk for occupational exposure to blood-borne pathogens, such as HBV, HCV, and HIV due to the unique nature of their work [12]. Suffering of these diseases can impact psychologically and financially on health care professionals [13.14].

Education and training courses are playing an important role in the control of infection. Over time, there have been changes in learning and teaching methods, and development from traditional to more interactive methods in all occupational areas [15].

Traditional education and training classes are less efficient for health-care professionals because of their workload, lack of time, and fatigue caused by working shifts. It seems that education and training should be done outside of these times, which can indicate the necessity to revise the manner of holding and teaching in-person training classes. Therefore, lack of sufficient attention to its nature and participation in class just to meet the task and get administrative privileges can be the main cause of non-effectiveness of these classes, which is confirmed by the study of [16].

Collectively, these issues have compelled us as nurse educators to establish a web-based educational course on blood-borne pathogens (BBPs) for health-care professionals to improve their knowledge, and practice about prevention of blood-borne diseases, and reduce the risk of occupational exposure to blood-borne pathogens.

Web-based learning is one method of training, which can change job-related plans and procedures, and provide low-cost services to a large group of the population by suitable notification [17].

The main benefits of web-based learning for health care professionals include improved access, convenience and flexibility; reduced travel expenses and time; adaptability to learning styles; just-in-time learning; and an interactive multimedia format [18]. Moreover, web-based training has the potential to tailor instruction to individual learners' needs and to enable all learners to acquire the competencies they need [19].

The current web-based blood borne course was designed based on the valid available literature and then modified based on the results of the preliminary assessment. The content of the web course was identified and the overall course goal translated into more specific learning objectives for each session. According to the revised Bloom's taxonomy, the learning objectives were developed to include the appropriate cognitive domains [20].

Since individuals vary in their learning styles, different instructional methods were used throughout the sessions of the course. The taken approach in designing the sessions go along with several studies which indicated that using of different instructional strategies and

illustrations forms is more effective in achieving the learning goals and promote effective learning [21'22'23].

In order to assess the effect of designed web-based blood borne course on knowledge, and attitude of health-care professionals about blood-borne pathogens, it was mandatory to assess healthcare professionals' baseline knowledge, and attitude in relation to blood-borne pathogens before conduction of sessions of the web-based course.

The finding of present study showed that the mean age of the health-care professionals (HCPs) was 29.097±6.50 years, about half of them were females, about three quarters of them are nurse, (14.5%) of them are physician, (8.1%) of them are lab technicians, and (4.8 %) of them are dentists, about one quarter of them worked in the medical department, the majority of them have a bachelor's degree, and about one third of them had experience from one to five years.

These findings were in agreement with another Egyptian study (**N., H and S, 2013)** [24]. which revealed that**,** the mean age of the respondents was 33.9 ±8.05 years, most of them are female, half of them are nurse, (14.7%) are physician, (6.5%) are lab technicians, and (8.8 %) are dentists, and around two third of them have a bachelor's degree.

Regarding previous training courses the current finding revealed that there was a lack of training courses regarding blood-borne diseases and infection control; where there were 75.8% and 54.8% of HCPs did not attend training courses about blood borne diseases and infection control respectively. This finding was matched with another Egyptian study (**N., H and S, 2013)** [24].which revealed that**,** there was only 39.4% of HCWs reported at least one previous training course regarding blood-borne diseases**.** From my point of view, the possible explanation of this deficient in training courses may be due to limited resources**,** workload, lack of time, and fatigue caused by working shifts**.**

Also in the present study, about half of HCPs reported a history of exposure to needle sticks and blood splashes during the last three months; this high incidence rate may be due to lack of adherence to standard precautions, inadequate supply of personal protective equipment, and lack of availability of safer sharp devices.

In Comparison with other Egyptian studies, this rate was lower than that reported by **Hanafi et al., (2011)** [25] who found that the rate of needle sticks injuries was more than two-thirds among the interviewed HCWs.

On the other hand this rate was much higher than that reported in Nigeria where **Ajibola et al, (2014**) [26] found that the total incidence of exposure to blood or body fluids among HCWs was 27%.

Concerning HBV vaccination among HCPs, the present study revealed that more than one third of the studied HCPs were vaccinated with three doses against HBV, this remarkably low rate of HBV vaccination may be attributed to busy work schedule, negligence, and lack

of awareness and low-risk perception of health care members.

These findings are seen as consistent with the findings of the study conducted in Egypt by (**N., H and S, 2013)** [24] who concluded that about 45.9% of the studied HCWs were vaccinated against HBV. On the other hand this rate is to some extend good in comparison with a systematic review conducted by **Auta et al., (2018)** [27] which concluded that many HCWs in Africa are at risk of hepatitis B infection as only a quarter of them were fully vaccinated against hepatitis B virus.

Concerning acquisition of knowledge, the study revealed that there was a highly significant improvement in the HCPs knowledge about blood-borne pathogens (BBPs) as regard overview about blood-borne pathogens, hepatitis B virus, hepatitis C virus, human immune deficiency virus, and prevention of blood-borne pathogens P< 0.001. Also, the mean of total knowledge score about BBPs among HCPs had significantly improved from 53.838±18.50 to 95.806±7.45 with a percent of change 77.9%.

This result clarifies that web-based training course might be an effective alternative to overcome the limitations of the existing training strategies in health care settings in Egypt. The possible explanation is the web-based training provides localized training at a lower cost, in a shorter time frame, and with less interruption of work-related and personal schedules. Additionally, in web-based courses the health care professionals were allowed to be autonomous and self-directed, to progress at their own pace, and were able to integrate their work experiences and prior knowledge with the new information presented in the course through discussions with the course instructor by e-mail and post-learning discussion.

These findings correspond with the finding of studies conducted by **Rapparini et al., (2007)** [28] in Brazil. Also **Choi and Kim, (2009)** [29] in Korea and **Tung et al., (2014)** [5] in Taiwan assessed the effect of web-based learning on the knowledge of health care workers about occupational blood-borne diseases. The findings indicated that web-based learning was effective, and can be used as a tool to increase knowledge and improve practices in the prevention of occupational blood-borne pathogen exposures.

Moreover, there are also studies that reported on web-based or online training programs that had been prepared for healthcare staff on subjects other than blood-borne pathogens that had increased the knowledge of the participants about the related subjects **George et al., (2014), Lee et al., (2018) , Karahan OkuroĞlu and Ecevit Alpar, (2018)** [30’31’32].

However, these results are congruent to **Zhan et al., (2017**) [33] who stated that blended-learning approach to basic public health services training could result in a higher knowledge achievement and satisfaction level compared with a pure e-learning approach. Furthermore, a systematic review by **Richmond et al., (2017)** [34] stated that online methods may be as effective as alternative methods for training HCPs in clinical interventions for

the outcomes of knowledge and clinical behavior.

Regarding to the health care professionals' attitude toward their blood-borne diseases and standard precaution, significant increase in positive attitude score was observed after web-based sessions P<0.001 and the mean score of attitude among HCPs had significantly improved from 55.04 ±4.32 to 64.85 ± 3.09 with percent of change 17.8%, additionally there was negative correlation between knowledge and attitude after completion of web-based course. . These results clarify that there was a change in HCPs' attitude after web-based sessions but the change that had occurred is not like the change in knowledge.

Researcher assumed that this slight increase in health care professionals' positive attitude may be due to the change in attitudes is slow, and attitudes, beliefs, and values are difficult to change. Thus, our study's time span may have been too short to internalize the new attitude. This view was confirmed by the study conducted by **Pitkänen et al., (2015)** [35] in Southern Finland assessed the impact of an e-learning course on nurses' attitudes towards mental illness. The findings indicated that it was hard to effect change in attitudes and e-learning course alone is not enough to endure changes in health care professionals' attitudes but simultaneous use of other interventions is required.

On a global view, the web-based blood borne course proved to be effective for health care professionals and resulted in improvement in their knowledge. Moreover, the easy accessibility, convenience, and self-paced of learning are the strengths of the web-based course. On the other hand, web-based learning has its disadvantages, such as instructors must spend time designing and creating it, maintaining and updating the program, and problems with uploading. Overall, however, the advantages outweigh the disadvantages

Conclusion:

Based on the findings of the present study, it can be concluded that web-based learning is an effective learning method for health care professionals in different health care settings that are able to overcome traditional education obstacles. The developed web-based blood-borne course resulted in improvement in health care professionals' knowledge, and attitude regarding blood-borne pathogens. They were satisfied with the course content and the illustration methods. It was recommended to disseminate the current web-based blood-borne course to others. It is recommended that further studies be conducted to evaluate retention in these teaching methods.

Recommendation:

Based on the findings and conclusions drawn from the study, the following recommendations are made:

For the hospital administrator

- Health care organizations should make access to the online program for health care staff.
- Embed e-learning courses into the continuing education system as a recognized learning method that could

enhance health care staff knowledge and skills.

- Continue with e-learning courses and ensure accessibility to the health care staff which provides the opportunity to be exposed to the most advanced ways of learning.

Further Studies are needed:

- Emphasis on health care professionals' outcomes in long-term knowledge and practices retention.
- Replication of the study on a larger probability sample should be done to achieve more generalizable results.
- Conducting additional studies on the obstacles that hindering web -based learning effectiveness in health care field and continue research efforts to improve features of e-learning environments.

1. Acknowledgements:

We would like to thank all health care professionals who participated in the study for their help and cooperation during the study period and appreciate the great efforts of the supervisors in this work**.**

Figure (1) illustrates the module structure plan, which consisted of a six-text lesson with educational multimedia such as audiovisual material

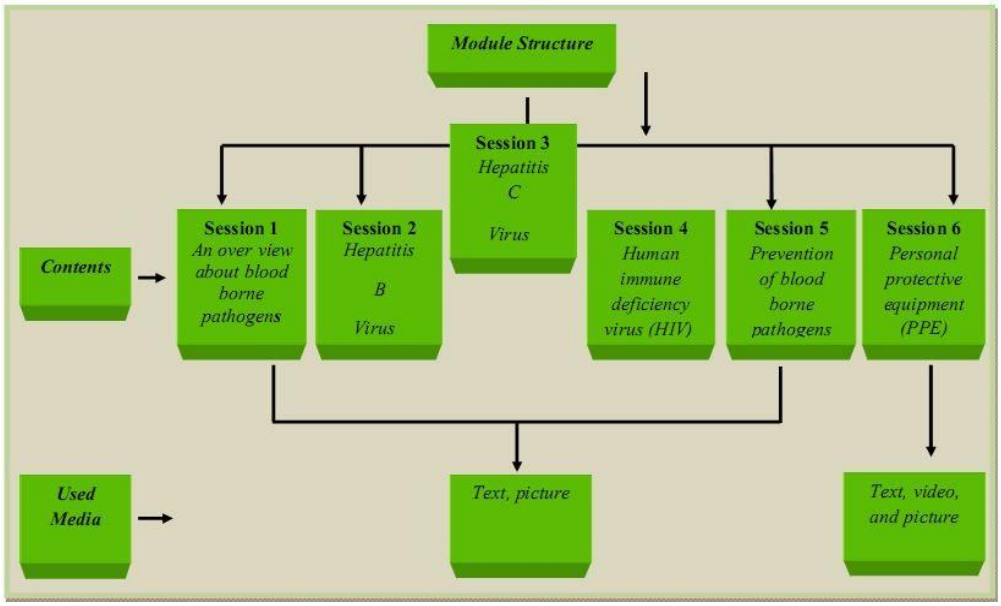

Figure (1) Web- based session structure plan

Box (1): Description of web-based blood borne pathogens course

Components	Description
Language	English.
Introduction	**Highlight on:** - The burden of occupational exposure to blood borne pathogens. - Required actions to reduce risk of blood borne pathogens exposure.
Intended users	Healthcare professionals.
Scope	Occupational health.
Goal	To provide healthcare professionals with required knowledge and skills about prevention of blood borne pathogens.
Specific objectives	-To identify blood borne pathogens. -To enable healthcare professionals to prevent exposure to blood borne pathogens.
Instructional strategies	Text, pictures, and videos
Content	
Session one: Overview of blood borne pathogens	- Chain of infection - Blood and other potentially infectious materials (OPIM). - Blood borne pathogens - Modes of transmission of Blood borne pathogens
Session two: Hepatitis B virus	- Definition of hepatitis B virus (HBV) - Mood of transmission - High-risk group and incubation period - Signs and symptoms of HBV infection - Hepatitis B serology - Treatment of HBV infection
Session three: Hepatitis C virus	- Definition of hepatitis C virus (HCV) - Mood of transmission - High risk group and incubation period - Signs and symptoms of HCV infection - Diagnosis of HCV - Treatment of HCV infection
Session four: Human Immunodeficiency Virus (HIV)	- Definition of human immunodeficiency virus and acquired immune deficiency syndrome (HIV/AIDS) - Mood of transmission - High risk group and Incubation period - The risk of HIV infection to a health-care worker - Diagnosis of HIV patient - Clinical features of HIV infection - Treatment of HIV
Session five: Prevention of Blood borne pathogens	- Exposure control plan - Standard precautions - Engineering controls - Work practice controls - Hepatitis B vaccine - Emergency procedures - Post-exposure evaluation and follow-up - Employee training - Recordkeeping
Session six: Personal protective equipment (PPE)	- Regulations and recommendations for PPE - PPE rules to follow - Factors influencing PPE selection - Types of PPE used in healthcare settings - Steps to put on and remove personal protective equipment (PPE)

Table (1): Distribution of healthcare professionals according to their occupational characteristics.

Items	N = (62)	(%)
> 30 Years	48	77.4
30-39 Years	8	12.9
< 39 Years	6	9.7
□±S.D(29.09□6.5years)		
Sex		
Male	28	45.2
Female	34	54.8
Occupation		
Nurse	45	72.6
Physician	9	14.5
Lab technicians	5	8.1
Dentist	3	4.8
Department		
Medical	16	25.8
ICU	14	22.6
General surgery	13	21.0
Gynecology	11	17.7
Dentist	3	4.8
Others	5	8
Qualification		
Bachelor's degree (BSc)	49	79.1
Postgraduate degree (MSc, Ph.D., Diploma)	13	20.9
Years of experience		
Less than one years	17	27.4
From 1-5 years	24	38.7
More than 5 years	21	33.9
Training courses about blood borne diseases		
None	47	75.8
Once	11	17.7
Twice and more	4	6.4
Training courses about infection control		
None	34	54.8
Once	14	22.6
Twice and more	14	22.6

Table (2): Distribution of healthcare professionals according to their history of exposure to needle sticks, receiving HB vaccine, and screening for blood borne viruses.

Items	N=(62)	(%)
Exposure to needle sticks during the last three months		
None	29	46.8
Once	17	27.4
More than once	16	25.8
Previous blood screening for blood borne viruses		
Screening for HIV	28	45.2
Screening for HBV	42	67.7
Screening for HCV	49	79.0
Receiving HBV vaccine		
None	18	29.0
One dose	3	4.8
Two doses	14	22.6
Three doses	24	38.7
Booster dose	3	4.8

* Responses are not mutually exclusive, multiple responses are possible

Table (3): Distribution of healthcare professionals according to their scores level of knowledge regarding blood borne pathogens.

Knowledge level	Test time N = 62				Significance	P value
	Pre		Post			
	N	%	N	%		
Overview about blood borne pathogens (12 marks)						
Good	18	29.0	58	93.5	Monte Carlo test [a]	.000
Fair	4	6.5	4	6.5		
Poor	40	64.5	0	0		
SD	5.54±2.74		9.50±1.23		t=10.488	.000
Hepatitis B virus (30 marks)						
Good	5	8.1	62	100.0	χ^2 = 105.5	.000
Fair	17	27.4	0	0		
Poor	40	64.5	0	0		
SD	12.43±6.16		23.46±1.79		t=14.080	.000
Hepatitis C virus (34 marks)						
Good	1	1.6	60	96.8	χ^2 = 113.0	.000
Fair	15	24.2	2	3.2		
Poor	46	74.2	0	0		
SD	14.22±4.93		26.96±2.46		t=17.584	.000
Human immune deficiency virus (26 marks)						
Good	3	4.8	59	95.2	χ^2 = 103.2	.000
Fair	11	17.7	3	4.8		
Poor	48	77.4	0	0		
SD	10.62±3.72		20.19±2.24		t=16.804	.000
Prevention of blood borne pathogens (22marks)						
Good	9	14.5	50	80.6	χ^2 = 59.10	.000
Fair	10	16.1	7	11.3		
Poor	43	69.4	5	8.1		
SD	11.00±4.33		15.67±4.14		t=5.740	.000
Total Knowledge level(124marks)						
Good	6	9.7	57	91.9	χ^2 = 88.17	.000
Fair	12	19.4	5	8.1		
Poor	44	71.0	0	0		
SD	53.82±18.50		95.81±7.45		t=16.542	.000

a: 2 cells have expected cell count <5
χ^2:Chi-square test. , t for paired t test
Good= scores more than 65% of total scores. (More than 80.6)
Fair= scores 50% to 65% of total sores. (62- Less than 80.6)
Poor= scores less than 50% of total scores. (0 – less than 62)
P: Significance.* Significant ($p \leq 0.05$).

Table (4): Mean difference between knowledge categories& total knowledge pre and post web-based sessions.

Knowledge categories	Pre	Post	% of change	Paired T test	P*
	Mean (SD)	Mean (SD)			
Overview about blood borne pathogens	5.54 (2.74)	9.50 (1.23)	71.4%	10.488	0.000
Hepatitis B virus	12.43 (6.16)	23.46 (1.79)	88.7%	14.080	0.000
Hepatitis C virus	14.22 (4.93)	26.96 (2.46)	89.6%	17.584	0.000
Human immune deficiency virus	10.62 (3.72)	20.19 (2.24)	90.1%	16.804	0.000
Prevention of blood borne pathogens	11.00 (4.33)	15.67 (4.14)	42.4%	5.740	0.000
Total Knowledge score (124 marks)	53.83 (18.50)	95.80 (7.45)	77.9%	16.542	0.000

T (Paired – Samples T test)
P (significance)
* Significant ($p < 0.05$).

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