

# Ebola Virus Disease: Development of an Educational Package for Nursing Students

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**Abstract:** Ebola virus disease is a serious, often deadly illness, which affects human being and inhuman primates. Ebola has recognized as a significant reason of illness and death, especially among health care personnel.

**Objective:** This study aimed to develop an educational package for Nigerian nursing students about Ebola virus disease.

**Design:** Cross-sectional descriptive study was used; College of Nursing & Midwifery, Kano state, Nigeria was the setting of the study. The sample consisted of 90 nursing students who were selected using convenient sample.

**Structured self-administered questionnaire to evaluate socio-demographic characteristics, knowledge, and practice of students regarding Ebola and an educational package evaluation tool.**

**Results:** Less than half (48.0%) were low socio-economic level, (45%) reported that media was the source of information, Most (87.8%) of the study group had fair knowledge level about prevention of Ebola. less than half (46.7%) had poor level about the disinfectant while more than one-third (38.9%) had good knowledge about the physical agent. For practice most of the students had improper practice for how to disinfect the surface and also following infection control measures.

**Conclusion:** Most of the study group had good knowledge score while most of them had improper level of practice and all the expert found the package is effective for raising the students' awareness about Ebola. The study recommended that updating and educating the nursing students about prevention of EVD and follow the universal precaution of infection control of the infectious diseases.

**Keywords:** Ebola virus disease, Educational package, Nursing students.

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## 1. INTRODUCTION

The emergence and spread of an Ebola outbreak is a growing problem worldwide, which poses a serious threat to public health. Ebola Virus Disease (EVD) is a serious acute illness that affects humans and other primates, which, if untreated, is often fatal and is a type of viral hemorrhagic disease. There are five known varieties of the Ebola virus, four of which caused the disease in humans. The infection was firstly recognized in 1976, outbreak happened at the same time in Nzara, Sudan including 281 patients out of which 151(54%) deceased [1] and Yambuku, the Democratic Republic of Congo including 318 patients out of which 280 (88%) deceased [2].

EVD outbreaks typically occurred in remote villages near tropical forests in Central Africa, and the disease got its name from the Ebola River, which flows near the village of Yambuku, where the outbreak initially happened [3]. The first incident of the existing EVD outbreak in West Africa was informed in Guinea in March 2014 [4], and from there it spread through land boundaries to Liberia and Sierra Leone, and to Senegal via land travel and Nigeria via air travel [5,6].

World Health Organization (WHO) announced EVD a "Public Health Crisis of Universal Concern" on August 7, 2014 [6]. The fatality rate of it has an average of 50% [6]. A total of 22,500 confirmed, probable, and suspected cases of EVD,

and nearly 9,000 deceases was reported in February 4, 2015 [7]. A total of 132 new confirmed cases were reported in the week completed to March 1 [8]. The case fatality rate of the existing outbreak in Guinea, Liberia and Sierra Leone is 76%; it is to some extent less (61%) in hospitalized patients [9].

In Nigeria, the first EVD incident was announced on 20th July 2014 when the diagnosis was made at a hospital in Lagos for a Liberian diplomat whose trip to attend the conference in Calabar, Cross River, Nigeria, was interrupted due to ailment and his consequent death. A chain of transmission was subsequently launched, which infected a total of 20 people, 8 of whom died from this infection [10].

Hospital workers were often infected during outbreaks of Ebola as a result of close contact with infected patients, where proper infection control measures are not being used. The outbreaks were also caused by burial practices, in which the mourners were in direct contact with the bodies of the dead. Nursing students should be aware of the mode of transmission and the period of infection to protect themselves from infection [10].

Infections acquired in medical institutions have been recognized as an important cause of morbidity and mortality, especially among health care workers. About 815 confirmed and probable cases of EVD with health care providers were reported in the last outbreak of EVD. Nurses, nursing assistants and nursing aids accounted for more than 50% of all infections of health care workers [11]. In Sierra Leone, the confirmed incidence of EVD was 103 times higher among HCPs than the general inhabitants. [12].

The word “package” was defined as a bundle of 2 or more interventions and refers to interventions at the community level. On the other hand; the education package may consists of all required materials that includes the most common techniques of providing health information to the population as verbal, written or audio-visual means, plus teaching strategies that motivate and inspire recall, understanding and retaining of the pertinent information in addition to evaluation methods [13]. An educational package is essential to the nursing students to be updated and educated about the prevention and control measures for caring of cases with infectious diseases to save the patient’s life and protect themselves.

### Significance of the study

Nursing students as future health workers, are at potential risk of contracting the disease and promote the transmission by occupational exposures. Their occupational health and safety is critical to the control of the outbreak and the maintenance of the health care workforce during the outbreak crisis [14]. Nursing students as a health care personnel should be trained to respond to the situation, prioritizing the implementation of infection prevention and control of infections and the systematic and comprehensive collection of comprehensive patient travel history. There is no licensed pharmacological agent or vaccine for the treatment and prevention of EVD. There is high need for the control of outbreaks; this requires health care personnel to be aware about the appropriate preventive measures, accurate and rapid diagnosis of cases [15]. Therefor the purpose of the study was to develop an educational package to nursing students about EVD.

**The study aim:** to develop an educational package for nursing students about Ebola virus disease

### Objectives

- Assess the students’ level of knowledge about EVD
- Assess the students’ practice regarding Ebola cases.
- Develop an educational package about EVD for nursing students.
- Assess the experts’ opinion about the developed educational package.

## 2. SUBJECTS & METHOD

**Research design:** Cross-sectional descriptive design.

**Study setting:** College of Nursing & Midwifery, Kano state, Nigeria from October-December 2014

**The study subjects:** students in the final year of college of Nursing & Midwifery.

Sampling technique: Convenience sample was used including all the students who was present in the class and giving their verbal approval.

#### **Tools of collection of data:**

Structured self-administered questionnaire was established in English linguistic by the investigators after rereading the associated literatures, it consisted of 4 parts: Part (1): demographic data includes age, sex, and socioeconomic status using socioeconomic scale [16] levels of the scale scored as follows: very low socio-economic; 1-21 marks, low socio-economic; 22-42 marks, middle; 43-63 marks and high;  $\geq 64$  marks. Part (2): source of information about EVD such as college, media, medical staff, relatives and friends.

Part (3): students' knowledge about EVD as concept, incubation period, modes of transmission, who is at risk, manifestations, and prevention. For the correct answer are awarded two ratings, 1 for the wrong and 0 for I do not know. The overall assessment of knowledge ranged from 0 to 108. The level of knowledge was classified as: Poor;  $< 50\%$  scores ( $0 - < 54$ ), fair;  $50\%$  to  $< 75\%$  scores ( $54 - < 81$ ) and Good;  $\geq 75\%$  scores ( $81-108$ ).

Part (4): students practice related to the infection control measures during contact with Ebola case. It is open-ended questions as: what are the health precaution practice that you must do during contact with Ebola case and also how to disinfect the surface? The practice level was categorized as proper practice  $\geq 50\%$  while improper practice  $< 50\%$ .

Tool (2): an educational package evaluation tool to assess the experts' opinion about the developing package comprising general format, content, literacy arrangement and legibility and typing performance by Likert scale extended from 0 to 2.

#### **Validity and reliability of the tool:**

Content validity of the developing tools verified by 5 specialists of community health nursing and medical-surgical nursing and the necessary changes were accomplished.

Reliability test was done by means of Cronbach's alpha test; 0.758.

**Development of the educational package:** The educational package about EVD arranged according to the literature review. Colored guide was created into English linguistic. The developed content was handed over to experts to establish the content validity and they were asked to give their opinion and suggestions on the content using checklist.

#### **Pilot study**

A pilot study was conducted for 10% of the sample size to check the applicability and relevance of the research tools and to check the clarity of the questionnaire developed. The necessary changes were made and these students were excluded from the sample.

#### **Ethical considerations**

Oral informed consent from the study group after clearing up the process of research and data collection and they were assured of the anonymity and confidentiality that will be maintained of the information given by them. They were well-versed about their constitutional rights of sharing or withdraw at any time.

#### **Operational phase**

- Approval to carry out the research from the principal of college.
- Data was collected from the students by using self-administered questionnaire that was explained and handed over to them to measure the students' knowledge, and practice about Ebola as well as infection control measures. Students were requested to return the filled questionnaire within 7-10 time. Before data collection, the investigator introduced herself and explicated the study purpose. Tool (2) was given to the experts to assess the internal validity of the developed package.
- 3 - hours interactive lecture with white board, subsequently a group discussion and demonstration. An educational package designed to raise the awareness, knowledge and practice of nursing students regarding prevention and management of EVD and to strengthen the implementation of standard precautions for infection prevention and

control. The package content included information about the epidemiology of EVD, incubation period, modes of transmission, who is at risk, manifestations, diagnosis and prevention as well as CDC’s Infection Prevention and Control Recommendations for hospitalized patients with known or suspected case and finally colored prepared English guide of EVD was given to the study group.

**Statistical analysis**

The analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 16.0. Data was analyzed using descriptive statistics like frequency, percentage, means and standard deviations to assess the students’ knowledge and practice about EVD and the expert opinion about the developed package.

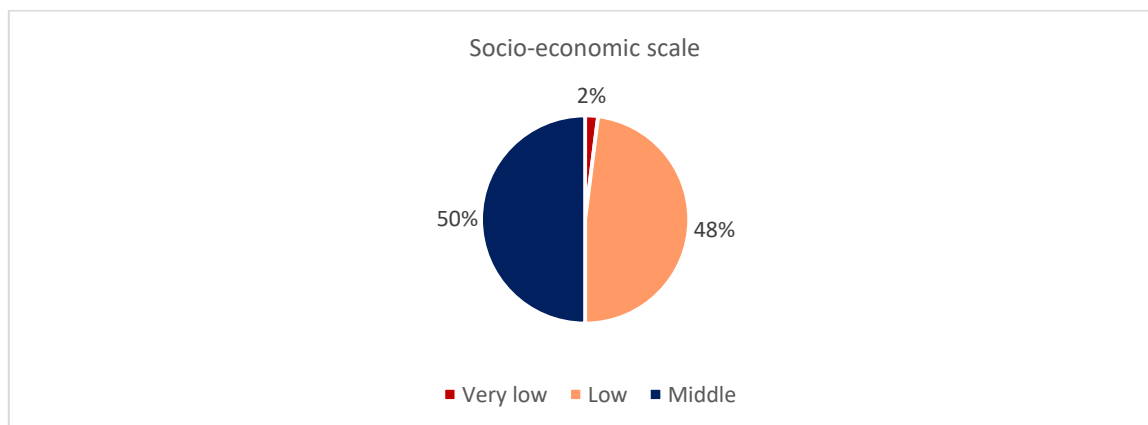
**3. RESULTS**

**Table (1): Distribution of the students regarding their socio-demographic characteristics (n=90)**

Items	N	%
<u>Age/ years</u>		
20 - < 23	33	36.7
23 - < 26	39	43.3
26 – 29	18	20.0
M ± SD		23.83 ±2.25
<u>Sex</u>		
Male	30	33.3
Female	60	66.7
<u>Residence</u>		
Rural	19	21.2
Urban	67	74.4
Urban slum	4	4.4
Heard about Ebola	87	96.6

Table 1 displays that less than half (43.3%) of the students in the age group of 23 to beneath 26 years, with a mean of 23.83 ± 2.25. About two-third (66.7%) of them were female. As regards to the residence, almost three-fourth (74.4%) lived in an urban setting. Most (96.6%) of the students heard about EVD.

Figure 1: illustrates that less than half (48.0%) of the students were low level and half (50%) were middle level while the minority (2.0%) were very low socioeconomic level.



**Figure (1): Socio-economic scale of the students**

Figure 2: illustrates that, less than half (45%) reported that media was the source of information followed by (25%) college, (13.5%) medical staff, (10%) family and the minority (6.5%) mentioned the internet was the source of information.

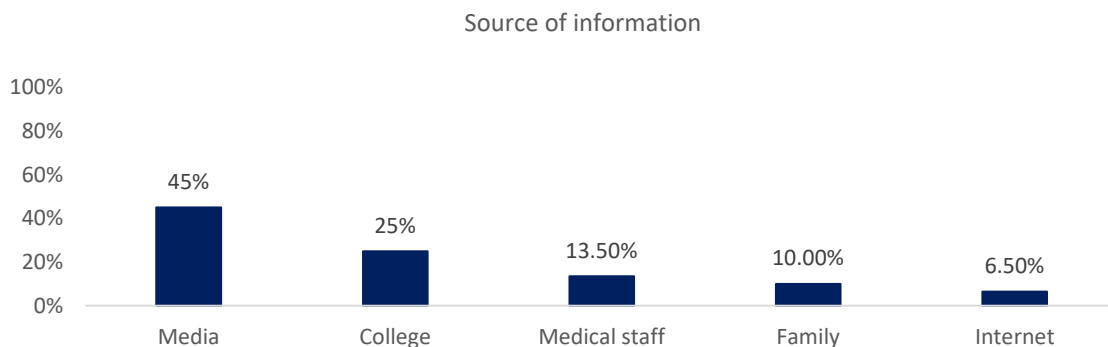


Figure (2): Students source of information about Ebola Virus Disease

Figure 3: displays that according to the students total level of knowledge about Ebola; most (74.44%) of them had good knowledge while (20%) had fair and the minority (5.56%) had poor knowledge level about Ebola virus disease.

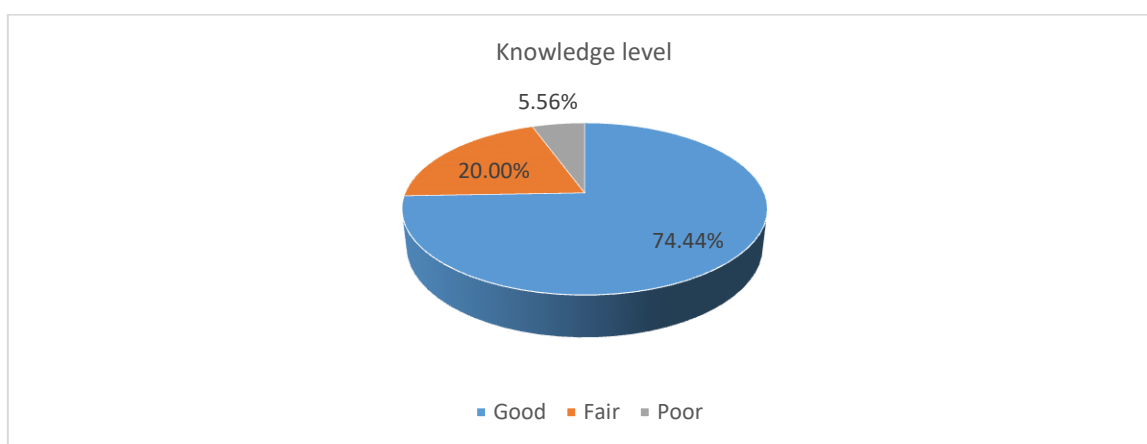


Figure (3): Students total level of knowledge about Ebola virus disease

Table (2): Distribution of the students regarding their knowledge of Ebola Virus Disease (n=90)

Items	Good N (%)	Fair N (%)	Poor N (%)	Mean ± S.D
Concept of Ebola (6)	6 (6.7)	81 (90.0)	3 (3.3)	3.86±0.65
Incubation period (8)	4 (4.4)	64 (71.1)	22 (24.4)	3.88 ± 1.11
Mode of transmission (16)	75 (83.3)	10 (11.1)	5 (5.6)	13.67 ± 3.39
High risk group (8)	79 (87.8)	6 (6.7)	5 (5.6)	7.28 ± 1.64
<u>Case definition of EVD</u>				
1. suspected case (6)	73 (81.1)	14 (15.6)	3 (3.3)	5.37 ± 1.32
2. Probable case (2)	60 (66.7)	17 (18.9)	13 (14.4)	1.47 ± 0.79
3. confirmed case (2)	80 (88.9)	6 (6.7)	4 (4.4)	1.84 ± 0.47
Typical signs & symptoms of infection (20)	4 (4.4)	81 (90.0)	5 (5.6)	17.92 ± 2.72
Diagnosis (8)	17 (18.9)	66 (73.3)	7 (7.8)	6.01 ± 2.03
Time of seeking for medical care (4)	81 (90.0)	5 (5.6)	4 (4.4)	3.62 ±0.94
Treatment (2)	---	26 (28.9)	64 (71.1)	0.28 ± 0.45

Vaccination (2)	1(1.1)	27 (30.0)	62 (68.9)	0.32 ± 0.49
Prevention (10)	7 (7.8)	79 (87.8)	4 (4.4)	9.08 ± 2.51
<u>Ebola virus destruction</u>				
1. Disinfectant (6)	22 (24.4)	26 (28.9)	42 (46.7)	3.53 ± 1.78
2. Physical agent (8)	35 (38.9)	33 (36.7)	22 (24.4)	4.56 ± 2.49

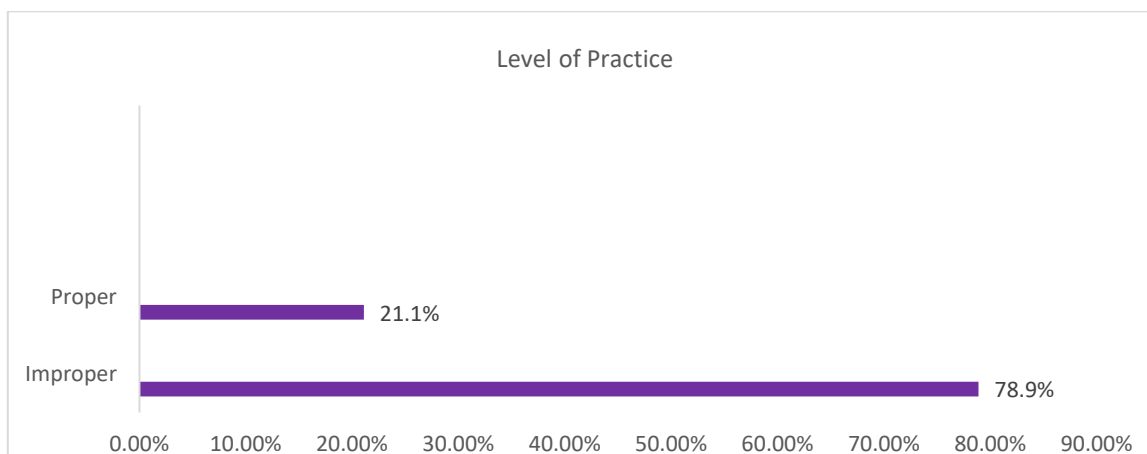
Table 2 elucidates that most (90%), (71.1%) of the students had fair knowledge level about the concept and incubation period of Ebola respectively. Regarding modes of transmission, high risk group, case definition and time of seeking of medical care, most (83.3%), (87.8%), (81.1%), (90.0%) of them had good knowledge respectively. As regards diagnosis around three- fourth (73.3%) had fair level and also most (90%) of them for signs and symptoms. For treatment and vaccination, more than half (71.1%), (68.9%) had poor knowledge level respectively. Most (87.8%) of the study group had fair knowledge level about prevention of Ebola. For Ebola virus destruction, less than half (46.7%) had poor level about the disinfectant while more than one-third (38.9%) had good knowledge about the physical agent.

**Table (3): Distribution of the students in relation to their practice of Ebola Viral Disease**

Items	Proper		Improper	
	N	%	N	%
Notify the public health office (1) M ± SD	85	94.4	5	5.6
	0.97 ± 0.29			
Follow the infection control precautions (6) M ± SD	10	11.2	80	88.8
	1.50 ± 1.63			
How to use disinfectant to clean contaminated surface (8) M ± SD	20	18.0	70	82.0
	1.82 ± 3.26			
Total practice level M ± SD	19	21.1	71	78.9
	4.13 ± 3.84			

Table 3 clarifies the practice of the study group about EVD, most (94.4%) of them know it is important to notify the public health office while most (88.8%) had improper practice following the infection control precautions. The minority (18%) properly use the disinfectant to clean the contaminated surface with EVD microorganism.

Figure 4 clarifies that most (78.9%) of the students had improper level while (21.1%) had proper practice level about Ebola Viral Disease.



**Figure (4): Students total practice level of Ebola Viral Disease**

Table (4): Distribution of experts' evaluation of the developed educational package printed materials (n= 10)

Items	N	%
<b>General format</b>		
Topic of educational package is essential and substantial	10	100
Objectives are mentioned	10	100
<b>Contents</b>	10	100
appropriate and efficient	10	100
suitable to the understanding level	9	90.0
<b>Literary Arrangement</b>		
Linguistic is clarified	10	100
Identifying headlines and subheads help student education	10	100
<b>Artworks</b>		
Clear outlines presented	9	90.0
Tilts are self –explicatory	10	100
<b>Legibility and typing performance</b>		
Character size and style are fit	10	100
Proper distance	10	100
Using of bold character and marker attract attention to the significant contented	10	100

Table (4) illustrates that all experts stated the topic of educational package is essential and substantial for the students and the objectives are mentioned. Most of experts (90%) confirmed that the content is suitable to the understanding level. As regarding to literary Presentation, all of them showed that linguistic is clarified and identifying headlines and subheads help student education. For artworks, the majority of experts (90%) mentioned outlines are clearly presented and all agreed that tilts are self- explicatory. All the experts revealed that character size and style are fit with proper distance. Also the use of bold characters and markers attract attention to the significant contented.

**Box (1) Educational Activities of an Ebola Virus Disease package**

Modules	Main activities	Teaching methods /media
<b>Module One: Ebola Viral Disease Epidemiology</b>		Interactive lecture using white board
Session one	Activity(1): Discussion about the epidemiology of Ebola	
<b>Module Two: Mode of transmission</b>		
Session one	Activity(1): Discussion about different mode of transmission	
<b>Module Three: Disease Symptoms</b>		
Session one	Activity(1): Discussion about general clinical manifestations Activity (2): Discussion about multisystem manifestations.	
<b>Module Four: Diagnosis</b>		
Session one	Activity (1): Discussion about the timeline of infections Activity (2): Discussion about the diagnostic tests Activity (3): Discussion about case definition for Ebola Virus Disease	
<b>Module Five: Contacts of an Ebola Case level of risk exposure</b>		
Session one	Activity(1): Discussion about the different level of risk exposure of the contacts	
<b>Module six: Ebola Case management &amp; Prevention</b>		
Session one	Activity(1): Discussion about the management of the case of Ebola Activity(2): Discussion about the prevention of Ebola	



Module seven: CDC’s Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected case		
Session one	<p><b>Activity (1):</b> Discussion about the patient placement characteristics.</p> <p><b>Activity (2):</b> Discussion about Healthcare provider protection measures</p> <p><b>Activity (3):</b> Discussion about different personnel protective equipment.</p> <p><b>Activity (4):</b> Demonstration of wearing Personal Protective Equipment correctly.</p> <p><b>Activity (5):</b> Discussion about disinfectant that use for contaminated surfaces.</p> <p><b>Activity(6):</b> Demonstration of cleaning of large spills or deposited fluid-contaminated area</p>	<p><b>interactive lecture using white board + Demonstration</b></p>

Box (1) elucidates the educational activities of each session all over the different modules of the package included 16 activities. Discussion was used all over the modules

Interactive lecture was used throughout the sessions of all modules using white board as a result of lack of resources as power outages, no computer or data show in the college. However, demonstration and re- demonstration was used in module seven to acquire skills of wearing PPE and cleaning of large spills or deposited fluid-contaminated area.

**Box (2) Description of the students' guide**

Components	Students guide
Language	English version
Introduction of the student guide	<p><b>Highlight on:</b></p> <ul style="list-style-type: none"> <li>- Epidemiology of an Ebola Viral Disease and the mode of transmission</li> <li>- Prevention and management of Ebola Hemorrhagic Fever following CDC’s Infection Prevention and Control Recommendations</li> </ul>
Intended users	Nursing students
Scope	It aims to raise the awareness, knowledge and practice of nursing students regarding prevention and management of an Ebola Hemorrhagic Fever and to strengthen the implementation of standard precautions for infection prevention and control.
<b>Content</b>	
Module one:	Ebola Virus Disease Epidemiology
Module two:	Modes of transmission
Module three:	<p><b>Message 1:</b> General clinical manifestation</p> <p><b>Message 2:</b> Multisystem manifestation.</p>
Module four:	<p><b>Message 1:</b> Timeline of infections</p> <p><b>Message 2:</b> Diagnostic tests</p> <p><b>Message 3:</b> Case definition for Ebola Virus Disease</p>
Module five:	Contacts of an Ebola Case level of risk exposure
Module six:	<p><b>Message 1:</b> Management of the case of Ebola</p> <p><b>Message 2:</b> Prevention of Ebola</p>
Module seven:	<p><b>Message 1:</b> Patient placement characteristics</p> <p><b>Message 2:</b> Healthcare provider protection measures</p> <p><b>Message 3:</b> Personal protective measures equipment, technique and its importance</p> <p><b>Message 4:</b> Disinfectant that can use for contaminated surfaces.</p> <p><b>Message 5:</b> Technique of cleaning large spills or deposited fluid-contaminated area</p>



Box (2) displays the contents of the students' guide that transcribed in English linguistic started with a background and epidemiology of EVD. This guide is a simplified handout for the nursing students' with the aim to provide adequate knowledge and practical skills to care for patients with EVD. Content was organized in seven modules, including 12 messages that are buttressed by pictures and emphases on what the nursing students should know and do.

#### 4. DISCUSSION

Ebola virus disease has a high case mortality rate. Health care workers have a key role to play in its management and prevention, the nursing students will graduate to become a member of the health care team [27]. Educational package is very effective for increasing knowledge, enhancing retention and implement correct practice [17]. Therefore, it is very important to develop an educational package for nursing students about EVD.

The study group source of knowledge about EVD in the current study revealed that most of the students heard about EVD and less than half obtained information through the media followed by college, which was in agreement with [18 & 19] who reported that most of the students had heard about Ebola. This also was in the same line with [20] found that more than half of the participants' reported media was the source of information followed by medical websites. This was in the same line with [21] who reported that less than half got their knowledge about EVD from media.

Concerning the students' knowledge about EVD concept, incubation period and investigation, the current study results revealed that most of the students had fair level of knowledge, which was collaborated by [20] who stated that most of the participant had knowledge about concept while less than half about incubation period and more than half had knowledge about the investigation. In contrast [22] reported that among 1413 individuals from multiple households in Sierra Leone, only 39% of respondent knew that EVD is a viral illness.

The participants of the study knowledge about mode of transmission shows that students had good knowledge. This was in the same line with [19] conducted a study in Tehran that assessed the knowledge, attitudes, and practices of students regarding Ebola Virus Disease Outbreak and showed that most of the students knew how EVD could be transmitted. This was in disagreement with [22] who found that misconceptions of EVD mode of transmission was evident among respondents in the KAP study in Sierra Leone, as 29.7% and 30.4% of them believed that EVD is transmitted by air or through mosquito bites respectively. And other study [20] found that nearly half of respondents chose air, and a fifth selected insects as a ways of EVD transmission.

Concerning the students' knowledge about signs and symptoms, most of the students had fair knowledge level. This was in disagreement with [19] who indicated that (34.4%) of the students were not able to identify correct options relating to signs and symptoms. The study revealed that majority of the students had good knowledge about high risk population. This does not conform to [18] who reported that less than half of the students have no idea about population most at risk for EVD.

Regarding the study group knowledge about the prevention of EVD, most of the students had fair level. This was in agreement with [23] who conducted a study to assess knowledge, attitude, and practice regarding Ebola Virus Disease and related factors among International students of Tehran University of Medical Sciences and showed that more than half had at least moderate knowledge about mode of prevention of the disease.

The present study finding showed less than one-third of the students had fair knowledge about the treatment and vaccination of EVD. This was dissimilar with [23] who found that more than half of the students correctly identified that no treatment and nor vaccine is available for EVD.

The study group overall knowledge level about EVD shows that around three-fourth of the students had good knowledge level about EVD which was similar to many studies conducted in Tehran in 2015 which revealed that most of the students were knowledgeable [23]. Another study in Sudan that assessed knowledge, attitude and practice of health care providers toward Ebola virus disease in hotspots in Khartoum and White Nile states showed that all the participant had good knowledge [20]. Similar study in Ethiopia among health care professionals in Adama hospital medical college (AHMC) Oromia region revealed that majority had good knowledge [24], In Pakistan a study also assessed knowledge and attitude of Ebola virus disease among medical students of Rawalpindi, found more than half of the study group had good

knowledge level [18]. This may be due to the effect of educational messages in the mass media about EVD and their educational background.

In relation to the students practice level, most of them had improper level while only more than one-fifth had proper practice level. This was incongruent with different studies [23, 18 & 15] who reported that the participants had proper practice level. The study results were similar with [19] which revealed that less than half of the students had proper preventive practice.

Nursing students had an important role in raising the community awareness about EVD's symptoms, history, modes of transmission, and methods of protection, including the importance of personal hygiene practices so they must have correct and updated knowledge through educational package. [25, & 26] stated that the communities should be educated on EVD via seminars and social media that can help to remove the misconception about the nature of the disease and indirectly improve the quality of life of affected patients and their families.

## 5. CONCLUSION

Students have basic knowledge regarding EVD concept, modes of transmission, and all the aspects related to EVD. However, there is deficient information regarding treatment, vaccination and Ebola virus destruction. Most of the study group had good knowledge level and the minority had poor level of knowledge while most of them had improper level of practice regarding Ebola and all the experts mentioned that the package is an important and effective for raising the students' awareness about Ebola Virus Disease and easily understood.

The educational package was developed to raise the nursing students' awareness in the terms of prevention and management of Ebola Hemorrhagic Fever and improve their practice in following CDC's Infection Prevention and Control.

## 6. RECOMMENDATIONS

Updating and educating the nursing students about the prevention and control of infectious diseases including EVD and following the infection control universal precautions is highly important because the students will be the health care provider.

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