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Effect of a Monkeypox Educational Program on Nurses'Knowledge, Attitude and Reported Practices

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Abstract: Background: Monkeypox is an infectious disease caused by a pox virus which is closely related to smallpox virus **Purpose:** To evaluate the effect of monkeypox educational program on nurses'knowledge, attitude and reported practices **Design**: A Quasi-experimental research design was utilized to fulfill the purpose of this study. **Setting**: The study was conducted at health care centers (Al-Sheikh Hassan, Al-Hadiqa and Kaiman Faris centers) in Fayoum governorate. **Sampling**: A Convenience sample consisted of 70 nurses. **Instruments**: Three instruments were used (Knowledge of nurses structured interviewing, nurses' attitude towards monkeypox and nurses' reported practice about monkeypox). **Results**: It was revealed that there was an improvement in total knowledge (0.828±2.69 Vs13.85±3.79), attitude (59.8±15.46 Vs 72.9±16.69) and reported practice on posttest than pretest and (9.07±11.58 to 31.85±6.63) respectively pretest versus posttest. **Conclusion:** It was concluded that monkeypox educational program increase nurses'knowledge, attitude and reported practices Recommendation: Nurses who work in other setting should receive educational program programs about care of monkeypox.

Keywords*: Educational program, health care centers, nurses, monkeypox.*

Introduction:

Monkeypox (Mpox) is an infectious disease caused by the monkeypox virus (MPXV), a double stranded DNA virus, that belongs to the Orthopoxvirus genus of the Poxviridae family. (3–5) Orthopoxviruses can cause disease in humans and other mammals. Symptomatic infection typically results in the formation of lesions, skin nodules or disseminated rash. Other orthopoxviruses (OPXVs) pathogenic to humans include Cowpox virus and

Variola virus (causing smallpox) World Health Organization (WHO)., 2024)1. Globally the total of 97,934 confirmed cases with 184 deaths .934 new cases were reported, with 61% originating from Africa, followed by America (19%) and Europe (11%). This global spread emphasizes the critical need for international cooperation to prevent and control the disease (WHO., 2024)2, U.S. Centers for Disease Control and Prevention (U.S.CDC).,2024).Monkeypox, originally an endemic disease in Central and Western Africa, has predominantly originated from the Democratic Republic of Congo. While the outbreaks outside the endemic regions could be traced back to travelers and animals from Africa. The initial case of 2022 Mpox was reported in the United Kingdom due to travel-related transmission. (Jiang et al., 2024).

Prevention of MPXV in healthcare settings includes patient isolation, use of personal protective equipment (PPE), hand hygiene, environmental cleaning, waste management, and staff training. In community settings, home isolation, hygiene practices, and regular cleaning are essential to prevent the spread of the virus. Vaccination is crucial in controlling the spread of MPXV, particularly for risk group. The vaccines primarily utilized for MPXV are based on those developed for smallpox, as viruses cause both diseases in the Orthopoxvirus family as JYNNEOS and ACAM2000 (U.S. CDC., 2024) (Pischel et al., 2024).

Educational program is the cornerstones of improvement in infection prevention and control (IPC). Community health nurses (CHNs) should be aware of the fact that knowledge is power. CHNS 's awareness should include issues related to hand hygiene, wearing personal protective equipment (PPE), immunization for prevention of monkeypox, modes of infection transmission, assessment of patients for infection, medical instrument decontamination, healthcare waste handling, and needle stick and sharp safety policy (Alhumaid et al., 2021). Health centers are vital primary care safety nets for underserved populations. It is one of a network of clinics staffed by a group of general practitioners and nurses providing healthcare services to people. Health centers are local clinics. They treat people's medical, dental, mental health, substance use, and other health care needs (Sun et al., 2024).

Community health nurses (CHNs) are essential in controlling infectious diseases at the primary level, as they are often the first point of contact for individuals with symptoms of viral infections, including monkeypox (Hammad et al., 2024). CHNs play a critical role in recognizing, managing, and educating the public about emerging infectious diseases within community settings (Kaler et al., 2022). This role is especially crucial for monkeypox, as CHN can directly influence the success of containment and prevention efforts through timely detection and proper patient isolation (Funk& Kucharski., 2022).Community health nurses provide accurate information and empathetic care, which

can foster trust and increase patient cooperation (Sadek et al., 2024).

Significance of the study:

Monkeypox is a significant public health concern globally. Data from WHO have revealed a pattern of rising infections of Mpox (WHO., 2024)3. Regarding the Arab world, several countries have reported confirmed cases of mpox. For instance, the United Arab Emirates reported its first case of the Clade 1b strain (WHO., 2025). Additionally, as of July 2022, five countries in the WHO Eastern Mediterranean Region reported a total of 18 confirmed cases: United Arab Emirates (13), Saudi Arabia (2), Morocco (1), Lebanon (1), and Qatar (1), with no reported deaths. The emergence of mpox cases in the Arab region underscores the importance of continued surveillance, public health preparedness, and community awareness to prevent further spread of the disease (Al-Mandhari et al., 2022).

Purpose:

To evaluate the effect of an educational program for nurses regarding monkeypox at on their knowledge, attitude and reported practices.

Research Hypothesis:

1) Nurses who receive an educational program are expected to have higher level of knowledge on posttest than pretest.
2) Nurses who receive an educational program are expected to have higher level of practice on posttest than pretest.
3) Nurses who receive an educational program are expected to have higher more positive attitudes towards monkeypox on posttest than pretest.

Methods:

Research design:

A quasi-experimental research design (pre- posttest) was used.

Setting:

The study was conducted at health care centers (Al-Sheikh Hassan, Al-Hadiqa and Kaiman Faris centers) of Fayoum governorate, Egypt.

Type of Sample:

A Convenience sample was used in this study. The sample was selected according to this equation.

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

Zα = Standard normal deviate for α = 1.9600.
Zβ = Standard normal deviate for β = 0.8416.
$B = (Z\alpha + Z\beta)^2 = 7.8489$.
$C = (E/S\Delta)^2 = 0.1128$.
N = B/C = 69. 5972.

$$\boldsymbol{n = \left(\frac{1.96+0.84}{0.1128.}\right)^2 = 69.5972 \approx 70}$$

nurses

- **Sample size:**

Was 70 nurses to achieve a power of 95% and a level of significance of 5% (two sided), assuming effect size 0.45 and SD 1.34.

Instruments

Three instruments were used in this study

Instrument one: Knowledge of nurses structured questionnaire.

It was developed by the researcher after a review of literature

- **Part 1**: Demographic characteristics of nurses at health care centers: this part composed of (5) close-end questions such as; age, sex, marital status, educational level, years of experience.
- **Part 2**: Nurses' knowledge questionnaire (pre – post test) about monkeypox composed of (15) close-end questions such as:
  prevalence of Mpox in Egypt, monkeypox is a viral disease, Mpox is a bacterial disease, Mpox is a contagious disease, definition, modes of transmission, similarity to chickenpox's signs and symptoms, causes of transmission, symptoms, diagnosis, monkeypox is treated by relieving symptoms and giving antiviral therapy, monkeypox symptoms can disappear without medications, compilations, there is a vaccination for monkeypox, and prevention.

Scoring system for each sentence

Each correct answer was assigned 1 point; incorrect answers were assigned 0 points

Total scoring:

- Adequate knowledge ≥ 60 % (≥ 9-15).
- Inadequate knowledge ≤ 60% (< 9).

Instrument two: Nurses' reported monkeypox practices checklist:

It was developed by the researcher after a review of literature. This part was constructed to assess the nurses' reported practices for the care of monkeypox. It contained 34 close-end questions. It included two parts as follows:

- **Part 1**: Nursing practices before monkeypox infection. It was composed of 24 questions e.g. as: avoid crowded places, wear a mask, wear gloves, wash hands with soap and water, etc.
- **Part 2**: Nursing practices during monkeypox infection. It contained 10 questions e.g. isolation, avoid sharing contaminated items, cleaning and sterilizing surfaces, etc.

Scoring system for each item:

Done: 1 point. Not done: Zero.

Total scoring system:

- Satisfactory reported practices: ≥ 60% (20- 34).
- Un Satisfactory reported practices: < 60 %. (< 20).

Instrument three: Nurses' attitude towards monkeypox Likert scale:

It was developed by the researcher after a review of literature. It was developed to assess the nurse's attitude towards monkeypox. It contained 39 questions such as: i think monkeypox is a punishment from God, mpox is due to climate changes, mpox is a bioterrorist agent, etc.

Scoring system of attitude:

Scoring system for each item

A three -point Likert scale was assigned to all questions (agree, Neutral and disagree) coded from one to three, as: (Agree = 3 Neutral = 2 Disagree = 1)

with 117 total score that summed up and divided to two categories as the following:

- Negative attitude < 60 (< 70).
- Positive attitude ≥ 60 (70- 117).

Validity:

The data collection instruments were reviewed by a panel of five experts in community health nursing (assistant professor) to test the face validity of them. Instruments were reviewed for content coverage, relevance, understanding, comprehensiveness, wording, length, format and overall appearance. Modifications were done based on the comments.

Reliability:

The study instruments were tested for reliability Cronbach's Alpha which was 0.827 for knowledge questionnaire, 0.89 for reported practices questionnaire, and 0.84 for attitude scale

Ethical consideration:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee Faculty of Nursing Helwan University before starting the study (25/7/2023). The researcher clarified the objective of the study to the nurses included in the study to gain their confidence and trust. An official written statement of nurse's approval to share in the study was obtained after they were told about the purpose of the study and methods of data collection by the researcher.

Pilot Study:

A pilot study was carried out on 10% from the study subjects (7 nurses) and was included in the total sample to test the applicability, clarity and the efficiency of the tools. There were no major modifications found after the pilot study.

Procedure:

Before conducting the study, an official letter was sent from the Dean of the Faculty of Nursing, Helwan University was directed to the selected health care centers administration in Fayoum governorate to obtain an official approval to carry out the study, It included an explanation of the purpose of the study and methods of data collection.

- At the beginning, the researcher introduced herself and explained the purpose of study for nurses to gain their confidence, trust and to convince them to participate in the study.
- Actual field work was carried out in the period from December 2023 years to May 2024.
- The researcher collected data one day per week (Sunday), from 9 am- 1pm. The questionnaires were distributed on nurses. All studied nurses filled sheet by themselves
- Each day 2-3 nurses were able to fill the data collection instruments. Each nurse consumed 30 minutes to fill the data collection instruments.
- The educational program was developed, implemented by the researcher. It was conducted in six sessions. (5 theoretical sessions and 1 practical session) each session took 40 minutes. Nurses were divided into 24 groups.

- Each educational session included 2-3 nurses.
- During practical session the researcher gave educational program to nurses individually.

Educational program:

It consists of four phases:

- **Phase 1: Preparatory phase:**

The educational program was designed by the researcher based on reviewing of the related recent, national and international literature and theoretical knowledge of various aspects of the study using books, articles, scientific journal and the internet. The content of the educational program was validated by a panel of expertise in community health nursing.

- **Phase 2: Assessment phase:**

This phase involved the pre-test data collection for baseline assessment, in this phase the researcher collecting the following data: the nurses' demographic characteristics, level of nurses' knowledge about (definition, causes, mode of transmission, sign and symptom, diagnosis, medication, prevention and complication), nurses' attitude, and nurses' reported practice.

- **Implementation phase:**

- Monkey pox educational program implementation was based on using different educational methods and media such as (group discussion, demonstration, CD, pictures, and posters or banner) in addition to the use of guiding booklet specifically designed and developed based on nurses assessment needs.
- Monkeypox educational program was implemented in the health care centers during researcher visits to the health care center one day/ week.
- First session included an orientation about the program; the elderly was informed about the time of program. Each session started by explaining the objectives of it taken into consideration using simple and clear language.
- Second session included meaning, prevalence, causes of monkeypox.
- Third session contained incubation period, signs, symptoms and mode of transmission of monkeypox.
- Fourth session involved and diagnosis and medications for monkeypox.
- Fifth session included prevention and complication of monkeypox.(Practical session)
- Sixth session (practical) it was entitled protection from infection.
- Teaching methods such as lecture, group discussion, demonstration, CD, booklet, pictures, and posters or banner.
- The researcher and the studied nurses shared for telephone numbers to be in contact and follow up with them.

- **Fourth: Evaluation phase:**

The educational program was conducted within six months

Statistical analysis:

Data was collected, coded and entered into a personal computer. It was analyzed with the program statistical package for social science (SPSS) version 19. The collected data was organized, revised, analyzed and presented in numbers and percentage in

tables, figures and diagram. Proper and suitable statistical tests were used to test the significance of the results obtained. The following statistical techniques were used (percentages, mean value, standard deviation, chi-square(X2), proportion probability (p-value) and T test.

- When P > 0.05, it is statistically insignificant difference.
- When P < 0.05, it is statistically significant difference.

Results:

Table 1 shows that 38.6% of the studied sample were > 50 years old, with mean and standard deviation values of age were 41.25± 12.58 years, 100% of them were females, 64.3% of them were married and had diploma degree. Regarding years of experience 68.6% ≤10 years to less than 20 years old.

Table 2 illustrates that there were improvements in the studied nurses' total levels of knowledge regarding monkeypox post education program. As 97.1% of the studied nurses had inadequate knowledge pre-program, it improved to 91.4% post-program with 3.67 values for T paired test and (P ≤0.05).

Table 3 clarifies that there were improvements in the total levels of attitude of studied nurses' regarding monkeypox pre and post education program (P ≤0.001). As mean and SD was 59.8±15.46 preprogram, it increased to 72.9±16.69 post program.

Figure 1 illustrates that there were improvements in the studied nurses' total levels of reported practices regarding monkeypox post education program (P ≤0.001). As 20 % of the studied nurses had satisfactory level pre-program and increased to 94.3% of them post-program.

Table 4 displays that there was a highly statistically significant positive correlation pre-education program between the studied nurses' total level of knowledge, attitudes, and reported practices regarding monkeypox (P ≤0.001).

Table 5 represents that there was a highly statistically significant positive correlation post -education program between the studied nurses' total level of knowledge, attitudes, reported practices and their health beliefs regarding monkeypox and its variants (P ≤0.001).

Table (1): Characteristics of Studied Nurses

Demographic data	The studied sample (N=70)	
	No.	%
Age	**41.25± 12.58**	
Age category		
20<30	**17**	**24.3**
30<40	**9**	**12.9**
40<50	**17**	**24.3**
≥50	**27**	**38.6**
Sex		
Male	**-**	**---**
Female	**70**	**100**
Marital status		
Single	**17**	**24.3**
Married	**45**	**64.3**
Divorce	**--**	**--**
Widow	**8**	**11.4**
Educational level		
Diploma degree	**45**	**64.3**
Institute degree	**15**	**21.4**
Bachelor's Degree	**10**	**14.3**
Number of years of experience		
Less than 5 years	**12**	**17.1**
From 5 to less than 10 years	**10**	**14.3**
From 10 to less than 20 years old	**48**	**68.6**

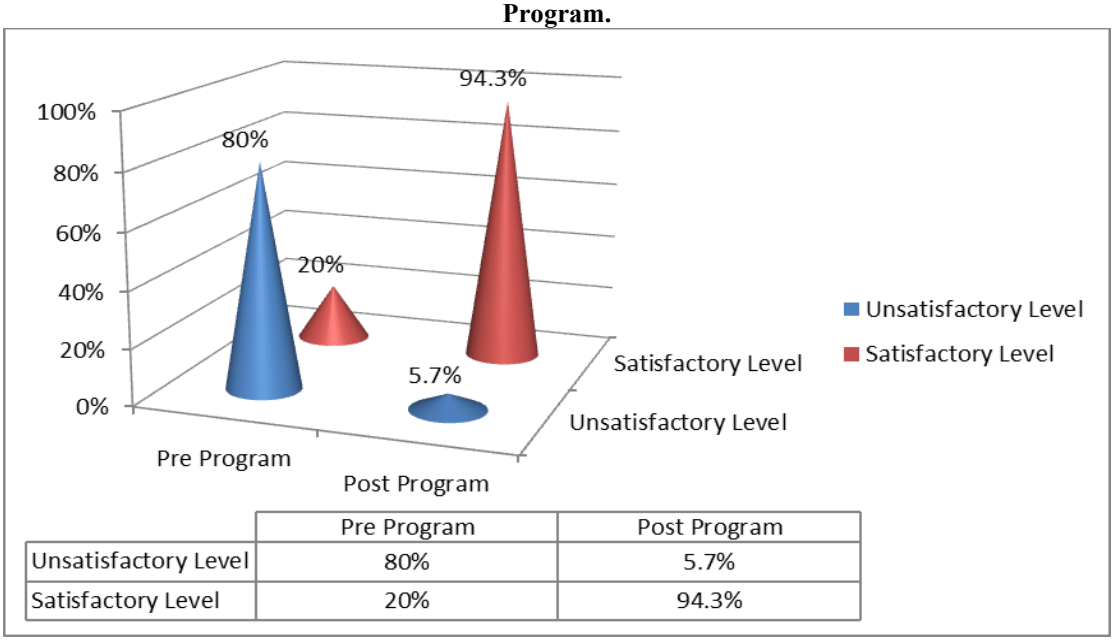
Table (2): Relation between Nurses Pre and Post Application of Educational Program according to Their Level of Knowledge (n=70).

Total knowledge scores	nurses pre and post applying program				χ^2	P
	Pre-applying		Post- applying			
	No.	%	No.	%		
Levels of total knowledge:						
Inadequate	**68**	**97.1**	**6**	**8.6**	**01.19**	**0.004**
Adequate	**2**	**2.9**	**64**	**91.4**		
Mean scores of total knowledge pre applying:	**15**					
Range	**0.828±2.69**					
Mean ± SD						
Mean change of scores of total knowledge post applying:	**15**					
Range	**13.85±3.79**					
Mean ± SD						
Paired T test	**3.67**					
P	**0.000****					

Table (3): Total attitude among nurses regarding monkey pox pre/post program (n=70).

Total attitude scores about	nurses pre and post applying program				χ^2	P
	Pre-applying		Post- applying			
	No.	%	No.	%		
Levels of total attitude:					**15.9**	**0.000****
Negative	**62**	**88.6**	**2**	**2.9**		
Positive	**8**	**11.4**	**68**	**97.1**		
Mean scores of total attitude pre applying:	**59**					
Range Mean ± SD	**59.8±15.46**					
Mean change of scores of total attitude post applying:	**35**					
Range Mean ± SD	**72.9±16.69** **1.23e2±6.86**					
Paired T test **P**	**26.9** **0.000****					

Figure (1): Distribution of Nurse according to the Level of their Reported Practices Pre/Post Program.



	Pre Program	Post Program
Unsatisfactory Level	80%	5.7%
Satisfactory Level	20%	94.3%

Table (4): Correlation between knowledge, practices, and attitude, pre applying program (n=70).

Knowledge, practices, and attitude	Changes of scores of total knowledge, practices, and attitude pre Program					
	Knowledge		practices		attitude	
	r	P	r	P	r	p
Knowledge	--	--	0.376	0.001**	0.282	0.018**
Practices	0.376	0.001**	--	--	0.504	0.000**
Attitude	0.282	0.018**	0.504	0.000**	---	--

*Significant at p ≤0.05 Not significant at p>0.05

Table (5): Correlation between knowledge, practices, and attitude post applying program (n=70).

Knowledge, practices, and attitude	Changes of scores of total knowledge, practices, and attitude post program					
	Knowledge		practices		attitude	
	r	P	R	P	r	p
Knowledge	**1**	**---**	**0.375**	**0.001****	**0.058**	**0.633**
Practices	**0.375**	**0.001****	**1**	**---**	**0.435**	**0.000****
Attitude	**0.058**	**0.633**	**0.435**	**0.000****	**1**	**---**

Discussion:

Human Monkeypox (HMPX), a zoonotic infectious disease caused by the Monkeypox Virus, causes smallpox-like symptoms in humans (Gong et al., 2022). Monkeypox can be transmitted mainly via contact with respiratory secretions, infected skin lesions, or contaminated materials. The incubation period of monkeypox usually can range from 5-21 days. The disease is often self-limiting, with symptoms occurring spontaneously. Symptoms can range from mild to severe, and lesions can be very itchy or painful. The animal reservoir is likely to be among rodents (Sah et al., 2022).

The purpose of this study was to evaluate the effect of an educational program for nurses regarding monkeypox at health care centers.

For the level of knowledge of studied nurses, the present study showed that the total knowledge among nurses were inadequate regarding monkeypox and this finding agreed with Rony et al., (2023) who conducted a study entitled" Knowledge and Attitude Regarding Human Monkeypox Virus Infection among Nurses: A Cross-Sectional Study in Bangladish" that reported study subjects' total knowledge was poor. Also, this finding was in the same line with Alshahrani et al., (2022) who conducted published study entitled as" Knowledge and attitude regarding monkeypox virus among physicians in Saudi Arabia: a cross-sectional study" that reported knowledge and attitudes regarding monkeypox infection are inadequate and influenced by various factors.

Regarding the effectiveness of the program on knowledge studied subjects, the present study revealed that there were improvements in the studied nurses' total levels of knowledge regarding monkeypox pre and post educational program .As the majority of the studied nurses had inadequate knowledge pre-program, which improved to the majority of them had adequate knowledge level post-program. Also, This finding was in accordance with Mahmoud et al., (2022) who conducted published study entitled as" Effect of educational sessions on human monkeypox viral infection among nurses: A quasi-experimental in Egypt" which reported that The use of educational sessions increased nurses' knowledge toward monkey pox. From the researcher's point of view, this might be due to the

effect of educational program on knowledge and skills of nurses.

Concerning nurses' attitude towards monkey pox in health care centers pre/post program, the present study showed that there were improvements in the studied nurses' total levels of attitude regarding monkeypox post educational program. As most of the studied nurses had negative level pre-program, which improved to the majority of them had positive attitude post-program. From the researcher's point of view, this result may be due the educational program was provided in a simple, clear and understood manner that helped to improve level of knowledge of nurses. In the same context, Mahmoud et al., (2022) published a study entitled "Effect Of Educational Sessions On Human Monkeypox Viral Infection Among Nurses: A Quesi-Expermintal In Egypt" who showed that nurses attitudes improved significantly at posttest.

Also, this result agrees with Ibrahim et al., (2024) who studied "Effect of Monkey pox nano-teaching sessions versus self-learning on nurses' knowledge, attitude, and confidence in disease diagnosis and management at University Hospital and the colleges at Mansoura University, Egypt" They found that significant improvements in the attitude of nurses compared to the control. From the researcher's point of view, this result may be due the educational program which helped to improve the level of knowledge of nurses and their positive attitude toward monkey pox. Towards monkey pox in health care centers, the current result illustrated that there were improvements in the studied nurses' total levels of reported practices regarding monkey pox post educational program. As, less than one quarter of the studied nurses had satisfactory level pre-program, the majority of them had satisfactory level post-program. From the researcher point of view, these results may be attributed to lack of awareness of the studied nurses about the correct practice for monkey pox care and prevention.

This result is in the same context with the result of study performed by Mahmoud et al., (2022) who stated that most studied nurses had poor practices regarding monkey pox management of its preventive measures before providence of the educational program regarding monkeypox comparing to after the providence of the educational program with statistical significant differences. Also, these findings are in harmony with Younis et al., (2024) who found that most of the participants had satisfactory practice score level regarding all aspects related to monkeypox in the post-test compared to the pre-test.

For correlation between knowledge, practices, and attitude, pre applying program among the studied nurses, the current study showed that there was a statistically significant positive correlation pre-educational program between the studied nurses' total level of knowledge, attitudes, and reported practices regarding monkeypox.

Concerning correlation between knowledge, practices, and attitude post applying Program, the present study revealed that there was a statistically

significant positive correlation post - educational program between the studied nurses' total level of knowledge, attitudes, reported practices and their health beliefs regarding monkey pox and its variants. This result is in congruent with Shan et al., (2023) that there was a positive significant correlation between knowledge and attitude monkey pox of the studied nurses at post educational program. Additionally, this result is in the same line with Ibrahim et al., (2024) who represented that there was a significant relation between knowledge and attitude regarding monkey pox of the studied nurses at post educational program.

Conclusion:

The results of this study concluded that there was a statistically significant positive correlation between the studied nurses' total level of knowledge, attitudes, and reported practices regarding monkeypox pre and post applying educational program (P ≤0.001) and there was an improvement in the studied nurses' knowledge, attitude and reported practice pre educational program versus post educational program regarding monkeypox. As 97.1% of the studied nurses had inadequate total knowledge level pre- program which improved to 91.4% post- program, 88.6% of the studied nurses had negative total attitude level pre- program which improved to 97.1% post- program and 80% of the studied nurses had unsatisfactory level of practice pre-program which improved to 94.3% post- program.

Recommendations:

Based on the findings of this study the following recommendations are derived and suggested:

1) Further research should be applied on large sample and other setting for generalization.

2) Campaigns to increase nurses' knowledge are necessary because controlling outbreaks necessitates extensive collaboration from knowledgeable and skilled healthcare providers through educational courses and awareness programs.

3) Replication of the program in other health facilities is required to improve the nurses' knowledge and practices regarding monkeypox.

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