Effect of Educational Toolkit on Pediatric Nurses' Knowledge, and Practices toward Noroviruses among Children

Fawzia Nabeel Mohammad Abd-Elmageed [(1)] , Reham El – Saeed Hashad[(2)], Rehab Abd El Aziz El Sayed Abd El Aziz[(3)]

(1) Pediatric Nursing Department, Faculty of Nursing, Zagazig University, Egypt.
(2), (3) Pediatric Nursing Department, Faculty of Nursing, Mansoura University, Egypt.

Abstract

Norovirus is recognized as a significant cause of gastroenteritis and is a major contributor to non-bacterial gastroenteritis in both industrialized and developing nations. In addition, after rotavirus, Norovirus is thought to be the second most common cause of severe pediatric gastroenteritis. *Objective*: To determine the effect of educational toolkit on pediatric nurses' knowledge and practices (KP) toward Noroviruses (NoV)among children. *Method*: 51 nurses working in the pediatrics departments at the Children's Hospital of Mansoura University (MUCH) in El-Mansoura Governorate, Egypt, and they were caring for children with acute gastroenteritis and were willing to participate in the study underwent a five-month quasi-experimental research design (pre-post intervention study). The study was conducted from the first of September2021 to the end of January 2022.*Results*:The post-implementation scores are significantly higher than the pre- implementation ones. 74.5 vs. 15.7for good sufficient knowledge, and 74.5% vs. 7.8 forgood satisfactory practice. The mean score of nurses' practice about Norovirus and its preventive measures was 27.48 ± 5.89. This mean improved to 41.37 ± 5.70 after the program implementation, with statistically significant differences at $p < 0.001$**.** *Conclusion*: It was concluded that, the educational toolkit had a positive effect on nurses' knowledge & practices as represented by a significant improvement in the post mean scores of knowledge and practice for nurses at the pediatric medical unit. *Recommendations:* Integrating Norovirus prevention measures and management into the routine nursing care and creating ongoing educational programs for nurses in response to their requirements/needs aiming to updating their knowledge and enhancing their care of pediatric patients who are infected with such viruses.

Keywords: Children, Effect, Educational Toolkit, Knowledge, Noroviruses, Nurses, Pediatric,   Practices

Introduction

Previously known as Norwalk-like viruses, noroviruses are a category of highly contagious viruses that could cause gastroenteritis, an inflammation of the stomach and intestines. Norovirus is now known to be a major cause of sporadic gastroenteritis in both children and adults, as well as the primary cause of non-bacterial gastroenteritis outbreaks **(Marsh et al., 2018)**.

Currently, it is believed that viruses from four main families—Reoviridae (rotavirus), Caliciviridae (norovirus and sapovirus), Astroviridae (astrovirus), and Adenoviridae (adenovirus)—are to blame for the majority of gastroenteritis in children. If surfaces, such as desks, doorknobs, and toys, are not thoroughly cleansed and disinfected, norovirus can remain there for weeks. Hospitals, schools, and daycare facilities are examples of settings where the norovirus can spread swiftly from one person to another **(Lively et al., 2018)**.

Although it is commonly referred to as the "stomach flu," influenza (flu) viruses, which primarily cause respiratory infection, are unrelated to it. The frequency of norovirus in children with acute gastroenteritis ranges from 6 to 48 percent. According to the US Centers for Disease Control and Prevention, norovirus causes 56,000–71,000 hospitalizations and 570–800 fatalities annually in the United States (US). Despite the fact that norovirus infections can occur at any time of the year, they are most common between November and April. As there are numerous strains of norovirus that could circulate at various times and in various locations, also, there may be an increase in norovirus cases when new strains start to circulate **(Verhoef et al., 2015)**.

Vomiting, diarrhea, and stomach cramps are common norovirus infection symptoms.

Less frequent symptoms include low-grade fever or chills, headache, and muscle aches. Although they could show up as soon as 12 hours after exposure, symptoms typically start one or two days after eating the virus. The sickness often strikes unexpectedly, and the affected kid may experience severe frequent nausea and, sometimes unexpected, vomiting throughout the day. Children who have the norovirus may occasionally show no symptoms at all but still could transmit the illness to others. Noroviruses spread quickly and easily. They are discovered in the vomit or stool (feces) of the infected patients. From there, noroviruses are spread from the infected individuals who have not properly cleansed their hands after using the restroom to food, water, or surfaces (**Bartsch, 2019**).

The children could catch the infection in a variety of ways, such as through direct or indirect contact with an infected individual (for example, by holding hands, or sharing foods or eating utensils used by an infected person, or by changing the diapers of a sick child), Eating or drinking food or liquids that have been exposed to the norovirus, such as undercooked shellfish from polluted waters or food that has been touched by an infected person, or before washing one's hands, after touching contaminated surfaces or items and then touching their own mouth, or utilizing the restrooms after a sick person and a youngster share them. Also, a person could catch the infection after dealing with nurses or other caregiver who, cleaning up vomit or diarrhea from a sick person without using gloves, masks, or other protective gear precautions (**Lopman et al., 2020**).

Most children get better in a day or two and do not suffer any long-term health consequences. In extremely young children and adolescents with compromised immune systems and dehydration could be a series complication for such group of patients. On rare occasions, sick kids may endure milder symptoms for a week or more. Additionally, the presence of the norovirus can be detected in a child's feces, and during an outbreak, confirmation of the illness's origin should be done by a public health laboratory as it is crucial in deciding what precautions to take in terms of prevention and control (**Ettayebi et al., 2020**).

Since norovirus is not a bacterial infection, there are currently no specific treatments or vaccines for it. However, the youngster should drink enough of fluids to avoid dehydration because of vomiting and diarrhea. The main method to reduce the spread of the virus in both hospitals and daycare facilities is to apply a strong infection control procedures (**Bucardo et al., 2018**).

When caring for a patient who has been diagnosed with acute gastroenteritis, several precautions must be taken, including washing hands with water and soap both before and after coming in contact with the patient or nursing supplies. Additionally, it is necessary to disinfect all surfaces with 2 percent hypochlorite35 because NoV can survive on dry, inanimate surfaces for up to seven days. Limiting the transmission of illness is largely dependent on caregivers' knowledge of how to handle these highly contagious viruses, especially in middle- and low-income nations. Therefore, mothers' knowledge and practices (KP) are greatly influenced by these measures because their ignorance about the norovirus disease would be a mediating factor to rise the viral infection cases (**Siqueira et al., 2019**) .

Significance of study

Norovirus has emerged as a pathogen associated with acute gastroenteritis which remain a relatively uncharted phenomenon for clinical nurses; because of the general awareness that acute gastroenteritis are commonly a bacterial infection, not a viral for pediatric patients who admitted in the hospital. Moreover, a scarce number of studies have examined this problem and a limited number of these employed a credible research design and produced reliable results that represented in a study was done in Mansoura University Children's Hospital, 2020 and revealed after the viral study of the collected stool samples for the children that noroviruses is the second common virus after rotaviruses (affect 40 percent of children)while, norovirus affect 37 percent of them and cause acute gastroenteritis. Therefore, it is necessary for pediatric nurses to have a recognized process of evaluating and

preventing norovirus infection **(El Sayed et al., 2020)** .

Aim of the study:

This study aimed to determine the effect of an educational toolkit on pediatric nurses' knowledge, and practices (KP) toward noroviruses among children**.**

Research hypothesis:

Pediatric nurses, who receive the educational toolkit, will have a significant improvement in knowledge, and practices toward dealing with noroviruses in children.

Materials and Method

Design: Pre-post implementation quasi-experimental study design was utilize.

Setting: The study was conducted in pediatrics medical departments affiliated to the Children's Hospital of Mansoura University (MUCH) in the city of El - Mansoura, Egypt.

Subjects:

A convenience sample of all nurses employed (51) in the study setting described above, irrespective of their age and qualifications or years of experience, caring for children diagnosed with acute gastroenteritis and willing to participate in the study.

Data collection tools:

Tool I: Nurses' demographic data questionnaire

Based on a survey of pertinent literature **(Siqueira et al., 2019),** the researchers were developed this tool. It was included, ages, sex, educational attainment, years of experience working in pediatric medical units, and prior participation in a norovirus prevention-training program were among the information provided.

Tool II: knowledge related to norovirus and its preventive measures questionnaire:

The researchers constructed this tool straightforward in Arabic language after analyzing pertinent literature **(El Sayed et al., 2020)**. 25 multiple-choice questions were used to test nurses' knowledge about the norovirus and its prevention. These questions covered the norovirus's description, incubation period,

symptoms, mechanism of transmission, and length of recovery, risks or issues associated to it, diagnosis, and preventive measures.A complete and accurate response to each question received a score of 2, whereas incomplete or unclear responses received a score of one or zero. Insufficient knowledge was deemed to exist if the percentage scores fell below 60%, while good sufficient knowledge was deemed to exist between 60% and 80%, and excellent sufficient knowledge was deemed to exist between 80% and 100%.

Tool III: Observation checklist sheet to assess nurses' Practices related to norovirus:

It was adopted from (**Parrón et al., 2019)**, and translated straightforward into Arabic language by academic's staff to assess nurses' performance in norovirus-related tasks. It included seven components as the following:

a) Wards (e.g., put up posters to alert visitors and staff, close impacted bays to admission and transfers, and keep room-bay doors locked).

b) Hand washing (e.g., use of liquid soap and warm water as per WHO moments for hand hygiene, as wellencourage and assist patients with hand hygiene).

c) Decontaminate regularly handled surfaces (using1,000-ppm chlorine available, as an example}

Equipment (d)(example: utilize single patient-use when possible, decontaminate equipment immediately after use, use water-soluble bags placed in a secondary bag when discarding linen from closed area and wear personal protective equipment).

E) Health professionals (e.g., ensure staff are aware of norovirus and how it transmitted)

F) Patient and family details (e.g., provide information on the outbreak, control measures, and inform visitors of risks and how to reduce it)

G) Monitoring (e.g., monitor children for signs of dehydration and mange it)

*The scoring system***,** each item coded as complete, incomplete, or not done. Each choice was given a score (2) if it was fully made, a score (1) if it was incomplete, and a score (0) if

it was not done, and thus the standard of practice for nurses was deemed unsatisfactory if their practice score was below 60 percent good practice was deemed to be between 60 percent and 80 percent and competent satisfactory practise was deemed to be between 80 percent and 100 percent (**Barke et al., 2017)**.

Method

- After outlining the goals of the study in letters to the director of the Children's Hospital of Mansoura University (MUCH) and the head of the medical pediatric unit in the aforementioned settings, the study was given the go-ahead. The researchers developed the instruments after analyzing the pertinent literature.

- **Validity of tools**: Five pediatric nursing staff and medical professionals from Mansoura University served as a jury to evaluate the study tools' content validity.

- **Reliability of tools**: The internal consistency of the tools' items was calculated using the Alpha Cronbach coefficient to ensure their dependability. The Alpha reliability for the three tools were as follows: r = 0.863, r = 0.878, and r = 0.776 respectively.

- **Ethical Considerations of the Study:** The University of Mansoura's Faculty of Nursing's Research Ethics Committee has received clearance. After the researcher explain the study's goals to thepediatric nurses, an informed consents were acquired. Their right to leave the study at any moment was granted, and the confidentiality and anonymity of the collected data were confirmed.

- **Pilot Study:** The pilot study was conducted on 10% from the total sample size to evaluate the tools' efficacy, applicability, and clarity; and to estimate time needed to fill the study tools. No modifications were needed so the sample included in the pilot study not excluded from the total study sample.

- Through reviewing the relevant related literature and evaluating of the actual needs of the nurses under study, which identify

after analysis the data obtained from the nurses during the pretest researchers created the instructional toolkit.

The educational toolkit about norovirus and its preventive measures:

Based on a survey of the literature, the researcher created this toolset. The program's topics contain an overview about norovirus, its incubation period, signs and symptoms, mood of transmission, hazards, and issues it could cause, high-risk populations, the length of recovery, diagnosis, treatment, immunizations, and preventative actions that should be taken to avoid transition of infection.

- The instructional toolkit was designed to increase the nurses' understanding of norovirus and its preventive measures based on nurses identified needs post analysis of the pretest

- It contains knowledge about the norovirus and its defense mechanisms, both theoretically and practically.

The field works

- After the norovirus toolkit's developed, nurses' knowledge and practices were evaluated using the questionnaire and the observational checklist. The time needed to fill tools was 30-40 minutes.

- From the first of September 2021 to the end of January 2022, a five-month timeframe was used for data collection and the application of the instructional toolkit.

- To encourage group conversation, the nurses were divided into small groups, each include from 5-8 nurses. Four sessions were used to apply norovirus toolkit, two theoretical sessions and another two practical sessions.

- Each didactic lesson lasted 20 to 60 minutes, and each practice session lasted 45 to 90 minutes during the two nursing shifts (morning and afternoon shifts).

- Different instructional strategies were employed, including seminars, group discussions, demonstrations, and re-demonstrations.

- The instructional program was given in a variety of methods, as using a colored

brochure, a power point presentation, videos, and handout guides.

- Utilizing the aforementioned research methodologies, nurses' knowledge and practice were evaluated twice: before and immediately following the completion of the instructional toolkit.

Data analysis:

SPSS 22.0 was used to process the data. The chi square test or Mann-Whitney U test is used to compare count data, which are reported as cases and percentages. The measurement results are given as mean standard deviation, and the t test was used to compare between-group differences. A P value of 0.05 or lower was regarded as statistically significant.

Result

According to **table 1**, less than half (45.1%) of the nurses included in the study were female and age group were 20-year-old or younger. In terms of years of experience, 41.2 percent of the nurses who participated in the study had experience in pediatric medical units around three years. Additionally, none of the nurses who participated in the study received any training about the prevent measures of norovirus.

Table (2);It was indicated that, before the program's implementation, the nurse's averages knowledge level about the norovirus and its preventative measures was 6.77 ± 2.38, which improved to 15.52 ± 2.65 after the program implementation. The differences were statistically significant, with = p<0.001.

When the program was implemented, 74.5 percent of the nurses had good sufficient

knowledge about norovirus and its preventive measures, up from 78.4 percent before the program implemented, and there were significant statistical differences between the nurses' knowledge levels before and after the program implementation regarding norovirus and its preventive measures with = p0.001, according to **table 3.**

Table (4) illustrated that, the mean score of nurses' practice about norovirus and its preventive measures was 27.48 ± 5.89. This mean improved to 41.37 ± 5.70 after the program implementation, with statistically significant differences with $p < 0.001$.

In the current study, **table (5)** showed that, at p=0.001, there were highly statistically significant variations between nurses' level of practice before and after the program's implementation according to the observational checklists. It was observed that before the program's implementation, the vast majority of the studied nurses had unsatisfactory practice level, which fell to 9.8 percent after the program implementation, while after program's implementation, 74.5 percent and 15.7 percent of the nurses had good and competent satisfactory practice level, respectively**.**

The correlation between nurses' knowledge, practice, age, and years of experience both before and after the program's implementation was shown in **table (6).** It was revealed that, there was a significant negative association between nurses' knowledge, practice with age before and immediately after the program implementation. While in relation to nurses' years of experience with their practice after program implementation with a highly statistically significant differences at equal p< 0.006.

Table 1: Number and percentage distribution of the studied nurses' characteristics prior to attendance norovirus training program (n=51)

Nurses' characteristics		No.	%
Age in years			
<20		23	45.1
20-<30		16	31.4
30- <40		8	15.7
40-<50		4	7.8
Sex	Male	3	5.9
	female	48	94.1
years of experience in medical pediatric units			
< 3y		21	41.2
3-<6		13	25.5
6-10		11	21.6
10& more		6	11.7
prior involvement in a training' program on norovirus' prevention	Yes	0	0.0
	No	51	100

Table (2): Comparison between the overall knowledge score of the studied nurses regarding norovirus and its prevention strategies before and after program implementation (n=51)

Knowledge score	Before program	After program
Mean ± SD	6.77 ± 2.38	15.52 ± 2.65
Significance test	Paired t test = 18.780, P <0.001*	

Statistical significance at p<0.05

Table (3): Comparison between nurses' level of knowledge regarded norovirus and related prevention measures before and after the program implementation(n=51)

Knowledge level	Values	Before program		After program	
		No	%	No	%
Insufficient	<60.0%	40	78.4	4	7.9
Good sufficient	60.0 - <80.0%	8	15.7	38	74.5
Excellent sufficient	≥ 80.0%	3	5.9	9	17.6
Significance test		χ^2=87.83, P<0.001*			

Statistical significance at p<0.05

Table (4): Comparison between the average total observational checklist score for norovirus' preventive measures before and after program implementation(n=51)

observational checklist score	Before program	After program
Mean ± SD	27.48 ± 5.89	41.37 ± 5.70
Significance test	Paired t test = 22.821, P <0.001*	

Statistical significance at p<0.05

Table (5): Comparison between observational checklist level of the nurses before and after programimplementation regarding norovirus' preventive measures(n= 51)

Practices level	Values	Before program		After program	
		No	%	No	%
Un satisfactory	< 60.0%	45	88.2	5	9.8
Good	60.0 - < 80.0%	4	7.8	38	74.5
Competent	≥ 80.0%	2	4	8	15.7
Significance test		χ^2=47.18, P<0.001*			

Statistical significance at p<0.05

Table (6); Association between nurses' knowledge, practice, age, and years of experiencebefore, after program implementation(n= 51)

r - P values Variables	r	p
Age with knowledge		
Before **program**	0.013	0.741
After program	0.142	0.110
Age with practice		
Before **program**	0.010	0.761
After program	0.121	0.274
years of experience with knowledge		
Before **program**	0.160	0.076
After program	0.101	0.322
years of experience with practice		
Before **program**	0.117	0.272
After program	0.294	<0.006*

Statistical significance at p<0.05

Discussion

The first line of defense against outbreaks of noroviruses is to stop their spread, especially in healthcare facilities and daycare facilities. The focus is on preventing and treating secondary dehydration, fluid therapy is often maintained orally with isotonic fluids, and hospitalization for cases with severe dehydration may be necessary because there is no enhanced antivirus agent to treat norovirus illnesses (**Sax et al., 2018**).

The current study revealed that, with regard to the characteristics of the studied nurses, none of them had participated in a training program on how to prevent norovirus (1). This result was consistent with a study done by **Lu et al., (2020)**, entitled "An outbreak of norovirus-related acute gastroenteritis associated with food delivery in Guangzhou, southern China," who found that the majority of nurses did not receive more attention or training regarding norovirus prevention. The researcher indicated that these findings might be due to nurses' heavy workloads and staff shortages, which consider an obstacle that prevent themfrom attending any training program.

The results of the current study showed that before the program's implementation, nurses' knowledge about norovirus and its preventative measures was low on average, but knowledge level increased to a high mean score with a very high statistically significant difference at p equal 0.001 **(table 2)**. This result did not agree with **Wainaina et al., (2020)**, in their study about norovirus infections and food handlers' knowledge, attitudes, and practices in an informal urban settlement in Kenya, which found that the majority of the study subjects had a high mean score of fundamental knowledge about norovirus and its infection prevention measures before implementation of the instructional program. From the researcher point of view, the finding of the present study might be due to multiple factors such as high percentage of nurses who were newly graduates and theyhad lowexperience less than 3 years.

More than three quarters of the studied nurses had insufficient knowledge about norovirus and its preventive measures prior to the implementation of the educational toolkit, but this percentage fell and a large percentage of them had good knowledge levels after the program implementation, with high statistically significant differences between nurses' level of knowledge before/after the program at pequal0.001 **(table 3)**. The results of the study titled "Norovirus in Latin America: Systematic Review and Meta-analysis" which done by **O'Ryan et al., (2017)** who concluded and claimed that before the intervention, nurses' understanding about noroviruses was lacking; however, after the

intervention implementation, there was an improvement, showing that most of them had good knowledge levels. According to the researcher, this study's findings could be attributable to nurses' lack of access to learning materials which keeping their current experience up to date. In addition, nurses may prioritize practice more than knowledge and have less years of work experience, which go with that they have insufficient knowledge about norovirus.

The present study illustrated that, the mean score of nurses' practice about norovirus and its preventive measures was 27.48 ± 5.89which improved after the program implementation, with a highly statistically significant differences with p=< 0.001**(table 4)**. This result did not coordinated with **Yang et al., (2019)** who studied" Analysis on risk factors for norovirus outbreaks in Guangdong province" and emphasized that, mean score of nurses' performance related to prevention of norovirus was high before program application. The researcher viewed that, this result might be related to shortage of nurses, lack of time to perform nurses activities due to shortage , lack of supplies and equipment which affect nurses' practice as well as may act as a barriers for them to carry out norovirus' prevention care into effective practice.

Relating to total nurses' practice about norovirus and its preventive measures, it was indicated that the majority of the studied nurses in the present study had unsatisfactory practice before the program implementation, which decreased to minority after the program implementation. While nearly, three quarters of the studied nurses had good satisfactory practice after the program implementation with a highly statistically significant differences at p equal < 0.001**(table 5)**. This finding was supported by **Assab & Temime's (2021)** who perform a study title "the role of hand hygiene in controlling norovirus spread in nursing homes" who reported that a high percentage of nurses had insufficient practice prior to the implementation of the intervention while the majority of them had adequate practice following the implementation of the intervention. This finding may be explained by the majority of the nurses' not attending any norovirus prevention training sessions and high percentage of them had poor knowledge related to norovirus and its preventive measures before

educational toolkit that affect negatively on their practices

As regards the association between nurses' knowledge, practice, age and years of experience before and after the program implementation, it was portrayed that, there was a significant negative association between nurses' knowledge, practice with age before and immediately after the program implementation except that related to years of experience with nurses' practice after program implementation with a highly statistically significant differences at p< 0.006 **(table 6)**.Result of the current study was consistent with **Atmar et al., (2018)** who studied " Human noroviruses: recent advances in a 50-year history" and proved that the length of work experience was significantly associated with nurses' practice regarding noroviruses' prevention measures. The researcher explained this finding in the light of, fact that, the years of working experience act as an important, independent and interrelated factor in carrying out and improving practices level regarding noroviruses prevention and management.

Conclusion:

Based on findings of the present study it was concluded that, the educational toolkit had a positive effect on nurses' knowledge & practices as represented by a significant improvement in the post mean knowledge and practice scores of nurses at pediatric medical unit.

Recommendations:

The study advocated integrating norovirus prevention measures and management into the routine nursing care and creating ongoing educational programs for nurses in response to their requirements /needs aiming to updating their knowledge and enhancing their care of pediatric patients who are infected with norovirus.

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