

Improving Nursing Care for Children with Pneumonia: The Effect of an Instructional Guidelines Program

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Abstract

Pneumonia is an inflammation of the lung parenchyma characterized by cough, sore throat, running nose, fast difficulty breathing, wheezing, fever, irritability, chest pain, chill and tachycardia. evaluate the effect of an instructional guidelines program for nurses in improving nursing care for children with pneumonia. A quasi-experimental design was utilized. This study was conducted at the Pediatric Intensive Care Unit in Beni Suef University Hospital. A purposive sample of 60 nurses included in the study working at the previously mentioned setting. for data collection included. An interviewing questionnaire, which comprised two parts; characteristics of the studied nurses and the is nurses' knowledge regarding to pneumonia. Observational checklist included actual performance regarding to care children with pneumonia. the minority (30%) of the studied nurses had good knowledge pre implementation of nursing program. While 78.3% of them had good knowledge post implementation of nursing program. 36.7% of the studied nurses had competent practices pre implementation of nursing program, while as 81.7% of them had competent practice post implementation of nursing program. The educational program had a significant positive effect on improving nurses' knowledge and practices toward children with pneumonia post implementation of nursing care program. Continuous in-service educational program should be designed and implementation to motivate nursing staff to achieve high level of nursing care.

Keywords: Children, Instructional, Guidelines Program, Nursing care, Pneumonia.

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1. Introduction

Pneumonia is considered one of the most serious lower respiratory tract infections in pediatric age group and one of the common causes of morbidity and mortality in children under 5 years of age [1]. Pneumonia is a form of acute respiratory infection that affects the lungs and it is defined as inflammation of the alveoli and interstitial tissues of the lungs by an infectious agent resulting in acute respiratory symptoms and signs. When the child has pneumonia, the alveoli are filled with pus and fluid, which makes breathing painful and limits oxygen intake [2]. The incidence of pneumonia in children under the age of five years is more than 150 million episodes of pneumonia occur every year among children under five in developing countries, accounting for more than 95 percent of all new cases worldwide. Between 11 million and 20 million children with pneumonia will require hospitalization with estimated annual death of 1.2 million.

This accounts for 18% of all deaths of children younger than 5 years worldwide and nearly all of those are children from developing countries [3]. Pneumonia can be classified

into several types depending on many variables includes the onset and course, severity of disease, the anatomical pattern, etiological factors, typical and atypical pattern. According to the onset and course of disease, pneumonia can be acute or chronic, progressive or improving, recurrent or first episode. It can be categorized according to severity of disease to be mild, moderate and severe depending on clinical observation [4]. Pneumonia transmitted through droplet spread from person-person through respiratory secretions during coughing and sneezing, the droplets transmitted into the air and someone else breathes them. Other routs of transmissions include direct oral contact, or indirectly through articles freshly soiled with respiratory discharge. Furthermore, it can be transmitted by birds (Psittacosis) or from environmental source (legionellosis).

Meanwhile, staphylococcus and gram-negative bacteria can be spread by the circulation from systemic infection or contaminated needle of intravenous invasions [5]. Common sign and symptoms in children and infants include cough, fever, chills, loss of appetite and wheezing, stuffy nose.

Children under five years with severe pneumonia may experience respiratory distress which is characterized by tachypnea, chest in drawing, grunting, flaring of the nose, cyanosis, and respiratory fatigue. Other symptoms are convulsions, unconsciousness, hypothermia, lethargy. Infected pleural effusions i.e. emphysema is becoming more common in children with pneumonia especially if the pathogen is pneumococcal [6]. Delijani et al., (2022) reported that the major complications of pneumonia include lung abscess, pleural effusion and emphysema, pneumothorax [7]. Other complications include overwhelming sepsis and septic shock, arthritis, osteomyelitis, meningitis, myocarditis and pericarditis. A lung abscess is a circumscribed, thick-walled cavity in the lung that contains purulent material resulting from suppuration and necrosis of the involved lung parenchyma. Diagnosis of pneumonia consists of two very important parts; first is to determine the syndrome by history clinical examination and chest radiology; secondly is the determination of etiology by laboratory tests. Intensive physical examination should be done with the respiratory system being the main center of attention or focus. Important information can be gained through careful observation and it is of great importance especially in very young children as they difficult to examine [8]. Prevention of pneumonia requires implementing effective measures in order to reducing mortality among children especially under five ages. These measures including immunization, adequate nutrition (exclusive breast feeding, zinc and vitamin A) Furthermore, some researches have also suggested that hand washing and lowering indoor air pollution play important role in reducing pneumonia death among children in developing world [9]. Nursing guideline program effect on children suffering from pneumonia is primarily supportive and symptomatic to meet the physical, psychological and social needs of each child. Therefore, their needs will be related to severity of illness. It can be conducted through observation of the child's respiratory status (respiratory assessment), administration of oxygen therapy and antibiotics, ensuring adequate hydration, promoting airway clearance, easing the work breathing, managing fever, and controlling of cough. Children with pneumonia are often debilitated and frightened, so they need quit reassurance as they undergo painful treatment and long period of care [10].

2. Significance of the study

Pneumonia remains the single largest cause of hospitalization and death among children under the age five years globally and in Egypt specifically the incidence of pneumonia is more than 2 million episodes of pneumonia occur every year among children under five in developing countries, accounting for more than 95 percent of all new cases worldwide. Between 11 million and 20 million children with pneumonia will require hospitalization with estimated annual death of 1.2 million. This accounts for 18% of all deaths of children younger than 5 years worldwide and nearly all of those are children from developing countries [11]. When nurses have awareness about pneumonia needs and practices in caring of children with pneumonia through instructional guideline program, they will have shown an improvement in their knowledge and practices about nursing care provided for children with pneumonia.

3. Aim of the Study

Evaluate the effect of an instructional guidelines program for nurses in improving nursing care for children with pneumonia. This will be accomplished through the following:

1. Assessing the nurses' knowledge and practice about caring of children with pneumonia.
2. Designing and implementing the instructional guideline program about nursing care of children with pneumonia.
3. Evaluating the effect instructional guidelines program in improving nursing care for children with pneumonia.

4. Research hypothesis

Providing an instructional guideline program for nurses would show an improvement in their knowledge and practices about nursing care provided for children with pneumonia.

5. Subjects and Methods

Subjects and methods for this study were portrayed under four main designs as follows:

1. Technical design
2. Operational design
3. Administrative design
4. Statistical design

5.1. Technical designs

The technical design for the study included design, setting, subjects, and tools of data collection.

5.1.1. Design

This study uses a pre- and post-quasi-experimental research design to achieve the aim of the study. We used a purposefully designed and validated instrument to evaluate nurses' knowledge and reported practices before and after the program. The study was conducted at the PICU in Beni Seuf University Hospital. The study was conducted between May 1st, 2021, and January 31st, 2022. During this time, the researcher was available in the study setting for 3 hours, 3 days a week (Saturday, Monday, and Tuesday). The sample size was at least 60 nurses. The sample size was satisfactory to estimate the proportion of participants who improved knowledge and practices.

5.1.2. Setting

The study was conducted in the Pediatric Intensive Care Unit (PICU) at Beni Seuf University Hospital. The PICU consists of one unit divided into two partitions and a closed room equipped with three beds for isolation cases; the total beds in the unit are fifteen.

5.1.3. Subjects

A purposive sample composed of (60) nurses working in the PICU caring for children with pneumonia, regardless of age, gender, years of experience, and qualifications, was included in the study from the mentioned setting.

A purposive sample of (20) children diagnosed with pneumonia in the previously mentioned setting was included in the study with the following:

5.1.4. Inclusive criteria

- Diagnosed with pneumonia
- Children under five years

5.1.5. Exclusive criteria

- Children with other chronic respiratory disorders

5.1.6. Tools of data collection

After an extensive review of the literature, two tools were used for data collection, as follows:

5.1.6.1. Tool 1

An interview questionnaire was designed by the researcher and reviewed by the supervisors. This tool was written in Arabic and divided into two parts:

- Part 1:** Nurses' characteristics such as age, gender, job position, nursing qualification, years of experience, and attendance at previous training programs related to pneumonia.
- Part 2:** Nurses' knowledge about pneumonia pre / post-test. This part was completed by nurses before and after the program application and comprised of (40) questions such as: definition, common season, mode of transmission, types, etiology, predisposing factor, sign& symptoms, investigation, complication, treatment, prevention and nursing care of pneumonia.

5.1.6.1.1. Scoring system

The nurses' knowledge assessment was scored as follows: A correct answer scored one, and an incorrect answer scored zero. These scores were converted into a percentage score. Scores of all questions (40 points) were summarized as total scoring and, according to them, categorized into:

- "Good" level of knowledge: 75%
- "Average" level of knowledge: 50% to < 75
- "Poor" level of knowledge: < 50%

5.1.6.2. Tool 2

It was adopted from Bowden & Greenberger (2012), and modified by the researcher to assess the nurses' actual practices regarding the care of children with pneumonia, including nasal prongs, oxygen masks, oxygen head boxes, chest physiotherapy, iv therapy, vital signs, suctioning, hand washing and naso-gastric tube insertion.

5.1.6.2.1. Scoring system

Observational checklists were used to evaluate nurses' practices regarding the child suffering from pneumonia. The correct answer is given a score of "one," and the wrong answer taken the score "zero." The total score practices equal 100 grades. The total scoring system for nurses' practice was classified into:

- 85% ≤ and above were considered "competent".
- 85% > was considered "incompetent".

5.2. Operational design

The study to be completed passed through different phases, including the preparatory phase, the pilot study, and field work.

5.2.1. Preparatory phase

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A review of national and international related literature covering all aspects of the research subject using books, journals, articles, periodicals, the internet, and nursing magazines in order to get a clear picture of the research problem as well as to design the study tools for data collection.

5.2.2. Pilot study

A pilot study was conducted on a group of six nurses (12%) prior to official data collection to assess the feasibility, duration, and cost of a full-scale research project. As no modifications were made to the study, the participants in the pilot were included in the main study as well.

5.2.3. Content Validity

It was ascertained by a jury consisting of three experts in the field. They were professors of pediatric nursing who revised the tools for clarity, relevance, applicability, comprehensiveness, and understanding. According to their opinion, minor modifications were applied.

5.2.4. Reliability

The Cronbach alpha coefficient was used to assess the internal consistency of the tool. The questionnaire value was (0.80).

5.2.5. Field work

- Official permission, including the title and purpose of the study, was submitted from the Dean of the Faculty of Nursing at Helwan University to the directors of Beni Seuf University Hospital to get approval for data collection to conduct the study, which was then forwarded to the Director of the PICU where the study was conducted, who explained the aim to them, the program content, and the expected outcome. The actual fieldwork was carried out for six months. The period was from the first of April 2020 up to the end of October 2021.
- The researcher interviewed the nurses daily from 9.00 a.m. to 12 p.m. for 3 days per week (Saturday, Monday, and Tuesday). Each interview took about 30–40 minutes to fill out after taking oral consent from them to participate in the care of children with pneumonia.
- The purpose of the study and the schedule of appointments were explained to the nurses.
- The actual study started by meeting the nurses in their PICU.
- The average time consumed by the nurses for completing the study tools ranged from 20 to 30 minutes and also depended on the nurses' own knowledge.
- The observation checklists were filled out by the investigator, and the time needed to fill them out depended on the time of the procedure. Each procedure's time ranged from 10 to 15 minutes.

5.2.6. Program construction

The present study was conducted in three phases:

5.2.6.1. Preparatory phase

A review of recent, current, national, and international related literature in various aspects of the problems was done to design the study tools, and then assessment was

done to determine the nurses' needs by using pretests based on the collected data on the nurses' knowledge and their practice toward the instructional guideline program for nursing care for children with pneumonia in the PICU. Nurses were assessed by using the previous tools; it took 8 hours every week for one month.

5.2.6.2. Program implementation phase

The program objective is to improve the nursing care for children with pneumonia in the PICU. The program content included two parts:

i. Theoretical part

The researchers write the theoretical part in Arabic after reviewing the related literature. It included knowledge about the definition, common season, mode of transmission, types, etiology, predisposing factor, sign& symptoms, investigation, complication, treatment, prevention and nursing care of pneumonia.

ii. The practical part

This part demonstrated the practices regarding care for children with pneumonia, such as nasal prongs, oxygen masks, oxygen head boxes, chest physiotherapy, iv therapy, vital signs, suctioning, hand washing and naso-gastric tube insertion .

5.2.6.3. Evaluation phase

This phase evaluated the effect of the instructional guidelines program on improving nursing knowledge and practice regarding the children with pneumonia in the PICU post-test, was the same pretest and was administered to the nurses after accomplishing the instructional guidelines program.

- Course duration: Total hours of the program for each group: 9 hours, 5.30 hours for the theoretical part (for ten sessions), and 3.30 hours for the practical part (for 5 sessions).
- Place: work places in PICUs
- Language: the program was conducted in the English and Arabic languages to be easily understood by nurses.

5.2.7. Teaching methods

- For knowledge: lectures, discussion, small group discussion, and brainstorming.
- For practice: demonstration and re-demonstration, video show, compact disc (CD), real equipment, posters, pictures, and role play.

5.2.8. Teaching media

Handouts were distributed to participating nurses as feedback for each session, as well as pictures, posters, and data shows.

5.2.9. Program construction

The program was designed by the researchers and is generally organized into three sections: an overview of the relevant disease process, a review of current evidence-based clinical practice, and a step-by-step treatment plan. The content was prepared according to nurses' educational needs for improving their practices regarding the care of children with pneumonia, such as nasal prongs, oxygen masks,

oxygen head boxes, chest physiotherapy, iv therapy, vital signs, suctioning, hand washing and naso-gastric tube insertion and nursing care in general.

5.2.9.1. The first phase (pre-pregame care for data collections)

- This phase started with interviewing nurses, and researchers introduced themselves to nurses. At the beginning of the nursing program, an orientation and explanation of the instruction guidelines program for nurses and the aim and objective of the study were explained to gain their cooperation.

- The data collected through interviews and observation was used by the nurses individually to identify background information and evaluate their knowledge and performance using checklists. The collection of data was done daily for three days per week using the Arabic questionnaire format and an observational checklist. The nurses were allowed to choose to participate or not.

5.2.9.2. The second phase (Program intervention)

- The researchers developed the program. The readiness of nurses for program exposure and implementation depends on the hospitals' available resources, such as training places and teaching aids such as audiovisuals. A program of care was developed based on actual needs for nurses to improve their knowledge regarding the care of children with pneumonia.

- The researchers wrote a clinical nursing program in Arabic after reviewing the related literature and covering the relevant theoretical aspects of pneumonia. It included knowledge about definition, common season, mode of transmission, types, etiology, predisposing factor, sign& symptoms, investigation, complication, treatment, prevention and nursing care of pneumonia, demonstrates the practices regarding care for children with pneumonia, such as nasal prongs, oxygen masks, oxygen head boxes, chest physiotherapy, iv therapy, vital signs, suctioning, hand washing and naso-gastric tube insertion.

- Constructing the nursing program contents was then followed by selecting suitable teaching methods and appropriate media for teaching. During the implementation of the nursing program, the researcher used the following media: A booklet with illustrative pictures was used in the educational sessions. It was given to the nurses at the end of the nursing program session, the Compact Disc (CD). It was also given to nurses with handouts for the revision of knowledge about pneumonia.

- The program intervention consumed 16 weeks, three days per week (Saturday, Tuesday, and Thursday) spent in conducting the training program; consequently, the subject content has been sequenced through 15 sessions. The duration of each session ranged from 45 to 60 minutes, including periods of discussion.

- At the beginning of the first session, an introduction to the protocol was given. Each session started with summary feedback about the previous session and started with simple words and Arabic language. Different methods of teaching were used, such as lectures, demonstrations, and re-demonstrations. Suitable teaching aids were prepared and used during the program implementation, such as real equipment, posters, and pictures.

- Each nurse was observed and evaluated using the observational checklist filled out by the researchers during the observation of nurses providing care for the child with pneumonia. Post-program intervention time consumed for assessing each procedure took nearly ten to twenty minutes. In addition, the nurses were interviewed to assess their knowledge using the questionnaire format; all questions were designated in the form of open questions, and nurses took about 30 to 45 minutes to fill it out.

5.3. Administrative design

Approvals to carry out this study were obtained from the Dean of the Faculty of Nursing at Helwan University. An official permission was obtained from the hospital administrators, at which the study was conducted, explaining the purpose of the study and requesting permission for data collection from the study nurses.

5.3.1. Ethical Considerations

Prior study conduct approval was obtained from the Scientific Research Ethical Committee of the Faculty of Nursing at Helwan University. The agreement for the participation of the nurses was taken after an explanation of the aim and nature of the study. The researcher informed the nurses that participation in the study was voluntary, and they were also assured that the information was used for research purposes only with confidentiality and anonymity, and they had the right to withdraw from the study at any time. The study maneuvers don't entail any harm to participants.

5.4. Statistical Design

Data entry and statistical analysis were done using the SPSS 22.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means, standard deviations, and medians for quantitative variables. Cronbach's alpha coefficient was calculated to assess the reliability of the tools through their internal consistency. Qualitative categorical variables were compared using the chi-square test. Spearman rank correlation was used for the assessment of the interrelationships among quantitative variables and ranked ones. In order to identify the independent predictors of occupational hazards and side effects scores, multiple linear regression analysis was used, and the analysis of variance for all full regression models was done. Statistical significance was considered at a p-value < 0.05.

6. Results and discussion

Table 1 shows that the mean age and SD of the studied nursing staff was 26.08 ± 4.43 , more than two thirds (66.7%) were females. It was found that (50%) of them were specialty diploma, and three quarter (75%) have 1-5 years' experience. Table 2 is regarding to nurses' knowledge about caring of children with pneumonia, this table clarifies that, less than half of the studied nurses (46.7% - 46.7% - 31.7%) had good knowledge pre implementation of nursing program as regarding definition, common season and mode of transmission respectively compared to more than two third of them (73.3% - 71.7% - 66.7%) had good knowledge post implementation of nursing program as regarding definition, common season and mode of transmission respectively, there was a statistically significant difference between pre and post implementation of

nursing program with p-value (0.008; 0.021 and <0.001) respectively. Additionally, less than half (36.7%, 23.3% and 46.7%) of nurses scored good knowledge pre implementation of nursing program as regarding types, etiology and predisposing factor respectively compared to more than two third (70%, 65% and three quarter 76.7%) of nurses scored good knowledge post implementation of nursing program as regarding types, etiology and predisposing factor respectively, there was a statistically significant difference between pre and post implementation of nursing program with p-value (<0.001, <0.001 and 0.003) respectively. Furthermore, slightly more than half of the studied nurses (58.3% - 53.3% - 43.3%) had good knowledge pre implementation of nursing program as regarding sign and symptoms, investigation and complication respectively compared to majority of them (81.7%; 83.3%), and slightly less than three quarter (68.3%) of nurses scored good knowledge post implementation of nursing program as regarding sign and symptoms, investigation and complication respectively, there was a statistically significant difference between pre and post implementation of nursing program with p-value (0.021, 0.002 and 0.018) respectively. As well as the less than half of the studied nurses (41.7% - 36.7%) had good knowledge pre implementation of nursing program as regarding treatment and prevention respectively compared to more than two third of the studied nurses (68.3% - 63.3%) had good knowledge post implementation of nursing program as regarding treatment and prevention respectively, there was a statistically significant difference between pre and post implementation of nursing program with p-value (0.012 and 0.005) respectively. As notices that the slightly more than one third of the studied nurses (38.3% - 23.3% - 31.7%) had good knowledge pre implementation of nursing program as regarding purpose of nursing care, daily nursing care and health education family and child with pneumonia respectively compared to more than two third (68.3% - 63.3%) and more than half of them (56.7%) had good knowledge post implementation of nursing program as regarding purpose of nursing care, health education family and child with pneumonia & daily nursing care respectively, there was a statistically significant difference between pre and post implementation of nursing program with p-value (0.003, <0.001 and <0.001) respectively. Meanwhile, more than one third (41.7% - 36.7% - 33.3% - 31.7%) of nurses scored good knowledge pre implementation of nursing program as regarding Oxygen therapy, Suction, Chest physiotherapy and IV therapy respectively compared to slightly less than three quarter (73.3% - 71.7%) also slightly more than two third (61.7%) and more than half (56.7%) of nurses scored good knowledge post implementation of nursing program as regarding suction, IV therapy, oxygen therapy and chest physiotherapy respectively, there was a statistically significant difference between pre and post implementation of nursing program with p-value (<0.001, <0.001, 0.009 and <0.001) respectively.

Table 3 represents that the total mean score of the practice about caring of children with pneumonia among the studied nurses it was mean of 135.30 ± 25.71 in pre implementation of nursing program compared to mean of 179.85 ± 34.17 in post implementation of nursing program as regarding total score of practice, there was a highly statistically significant difference between pre and post implementation of nursing program with p-value (<0.001), there was a statistically significant improved of mean score

of domains practice at pre-program compared to post-program, with p-value ($p < 0.001$). Table 4 shows that 68.2% of nursing with poor knowledge were incompetent practice while 65% with average knowledge were incompetent practice. Also clarifies that 55.6% of them with good knowledge were incompetent practice, there is no statistically significant relation between level of total pre-program knowledge and level of total pre-program practice with p-value ($p > 0.05$ NS). This chapter discussed the results of the current study and compared them with other related studies and recent literature, as well as representing the researcher's interpretation. Pneumonia is defined as an infection of the small air sacs of the lung (alveoli) and the tissue around them [12]. It is also defined as an inflammation of the lung parenchyma characterized by cough, sore throat, running nose, fast difficulty breathing, wheezing, fever, irritability, chest pain, chill, and tachycardia [13]. The nursing program is a method for teaching nurses and is designed for independent education in an attempt to avoid any strain from acquiring new information at any time. Moreover, it has an appositive effect on the nurses' knowledge and improves the quality of nursing care given to children with pneumonia [14]. The aim of this study was to develop an instructional guidelines program for nursing practice for improving the care of children with pneumonia by evaluating nurses' knowledge and practices regarding pneumonia, designing, implementing, and evaluating the effect of the instructional program on improving nursing care for children with pneumonia. As regards nurses' characteristics, the present study revealed that half of them had a specialty diploma in nursing, while for three-quarters of nurses, their experience ranged between 1 < 5 years. Moreover, the majority of the studied nurses worked as staff nurses. These results correspond with Sedki (2010) study entitled "Assessment of knowledge and skills of nurses giving care to children with pneumonia," which found that less than half of the studied nurses worked as staff nurses [15]. These findings were also in agreement with Mohamed et al., (2011), who found that the highest percentage are technical institute diplomas and diplomas with specialties, while a relatively small percentage of nursing staff have bachelor degrees in a study entitled "Effect of an educational program on nurses' performance during the golden hours of care for critical care such as pneumonia in Egypt" [16]. Regarding the nurses' years of experience, the findings of the present study revealed that the mean years of experience of nurses in the PICU were $4.68 + 2.77$ years. As reported by Ismail et al., (2015), the highest level of knowledge and skill was found among the nurses with less than 5 years of experience in a study about "the effect of nurses training on ventilator-associated pneumonia (VAP) prevention bundle on the VAP incidence rate at a critical care unit" [17]. This result was in agreement with Ibrahim et al., (2015), who reported that, by increasing the years of experience, the nurses have to learn more to improve nursing care.

Meanwhile, Ali (2013) study illustrated that more than two-thirds of nurses had experience between five and ten years in a study done about "critical care nurses' knowledge and compliance with ventilator-associated pneumonia bundles" [18]. As regards attending training courses, it was found that no one of the studied nurses attended previous training courses about pneumonia. This result was supported by Kamar et al., (2018), who reported that none of the studied nurses attended previous training courses about "the effect of a nursing care

protocol on the duration of hospitalization of children with pneumonia". From the researcher's point of view, this may be due to a shortage of staff and workload in the pediatric intensive care unit. In relation to the studied nurses' gender, the current study showed that more than two-thirds of the studied were female. This result is in line with Jahansefat's et al., (2016) study entitled "Exploration of knowledge of adherence to, attitude, and barriers to word evidence-based guidelines (EBGS) for prevention of ventilator-associated pneumonia (VAP) in health care workers of pediatric cardiac intensive care units (PCICUs)," in which more than half of the studied nurses were female [19]. From the researcher's point of view, this may be due to the fact that a greater fraction of the nurses in Egypt were females, and it may also be related to the fact that the study of nursing in Egyptian universities was exclusively for females until a few years ago. As regards nurses' knowledge about caring for children with pneumonia, the present study mentioned that less than half of the studied nurses had good knowledge about the definition, common season, and mode of transmission of pneumonia before the implementation of the nursing program. While more than two-thirds of them had good knowledge after the implementation of the nursing program, such a finding was supported by Coffin et al., (2017) who conducted a study about "strategies to prevent pneumonia in acute hospitals". The study illustrated that nurses' knowledge about the definition, common season, and mode of transmission of pneumonia increased after the implementation of a health program. Regarding nurses' knowledge about caring for children with pneumonia, it illustrates that slightly more than half of the studied nurses had good knowledge about signs and symptoms and investigation of pneumonia before the implementation of the nursing program, whereas the majority of the studied nurses had good knowledge after the implementation of the nursing program. Such a result agreed with Hansson (2014), who conducted a study about "the effectiveness of education on nurses' knowledge and skills in adhering to guidelines to prevent pneumonia" and reported that most of the studied nurses had good knowledge after the implementation of a nursing program [20]. From the researcher's point of view, this result may be due to the fact that the program of care always keeps the nurses aware of recent advances in their area of specialty and maintains their efficiency in carrying out activities, so the quality of care will be improved. Regarding nurses' knowledge about complications of pneumonia, it was noticed that less than half of the studied nurses had good knowledge before the implementation of the nursing program. Meanwhile, slightly less than three-quarters of them had good knowledge after the implementation of the nursing program. The result of the current study was in agreement with Elsobkey et al., (2018), who conducted a study about the "Effect of an Educational Guidelines Program on Nursing Care of Neonates Receiving Continued Positive Airway Pressure" [21].

It is found that less than half of the studied nurses had good knowledge before the implementation of the nursing program [21]. From the researcher's point of view, this result may be due to the fact that most of the studied nurses were newly graduated. Regarding nurses' knowledge about medications and prevention of pneumonia, it was noticed that less than half of the studied nurses had good knowledge before implementation of the nursing program, whereas more than two-thirds of them had good knowledge after implementation of the nursing program. These results were similar to those

reported by Abdelfattah et al., (2019) in a study in Egypt entitled "Impact of nursing guidelines on nurses' knowledge and performance regarding the prevention of ventilator-associated pneumonia in neonates," who reported that less than half of the studied nurses had good knowledge before implementation of the nursing program. From the researcher's point of view, this result may be due to a lack of motivation to update their knowledge. Regarding nurses' knowledge about nurses' care of children with pneumonia and the purpose of nursing care, the present study illustrated that about less than one-quarter of the studied nurses had good knowledge before the implementation of the nursing program. Meanwhile, more than two-thirds of them had good knowledge after the implementation of the nursing program. As mentioned by Lau et al. (2018), who conducted a study about "pneumonia-related hospitalization among children," they reported that less than one quarter of the studied nurses had good knowledge before the implementation of a nursing program. From the researcher's point of view, this result may be due to a lack of awareness about the nature of the disease and its care in the study about the introduction of respiratory disease in Egypt.

As regards knowledge about providing family and child health education about pneumonia, the findings of the current study illustrated that one-third of the studied nurses had good knowledge before the implementation of the nursing program, while more than two-thirds of them had good knowledge after the implementation of the nursing program. Such a result came in line with Fores et al., (2019), who conducted a study about "keeping children out of hospitals and how pediatric hospitalization can be avoided," and reported that more than two-thirds of them had good knowledge about family and child health education about pneumonia after the implementation of a nursing program. From the researcher's point of view, this result may be due to the fact that the program of care always keeps the nurses aware of recent advances in their area of specialty and maintains their efficiency in carrying out activities, so the quality of care will be improved. Concerning nurses' knowledge about suction, oxygen therapy, chest physiotherapy, and I.V. therapy, the present study showed that more than one-third of the studied nurses had poor knowledge before the implementation of the nursing program, while more than two-thirds of them had good knowledge after the implementation of the nursing program. This finding was agreed upon by Ahmed et al., (2016), who conducted a study about the "Effect of nursing care protocol on the reduction of ventilator-associated pneumonia" and reported that more than two-thirds of the studied nurses had good knowledge after the implementation of the nursing program. From the researcher's point of view, this could be attributed to the fact that, in order to achieve the maximum level of knowledge, continuous in-service training is required. Concerning the total mean and standard deviation of the nurse's knowledge about pneumonia, it was noted that the mean and standard deviation of the nurse's knowledge were significantly higher on the posttest than on the pretest. This result was consistent with Badawy (2019), who conducted a study about "the impact of a structured teaching program for the prevention of ventilator-associated pneumonia on the knowledge and practices of intensive care unit nurses" [22]. The study revealed that the total mean and standard deviation of nurses' knowledge increased on the posttest than on the pretest. From the researcher's point of view, this could be attributed to the effectiveness of the theoretical session of the program of care, which was given by the researcher and had a

positive effect on improving nurses' knowledge. Regarding nurses' practices about total practice of oxygen therapy for children with pneumonia, the present study clarified that less than half of the studied nurses had competent practice about nasal, mask, and head box oxygen before the implementation of the nursing program, while slightly less than three quarters of them had competent practice after the implementation of the nursing program. Such a result was agreed upon by Kamar et al., (2018), who conducted a study about the "Effect of a Nursing Care Protocol on the Duration of Hospitalization of Children with Pneumonia," who reported that three-quarters of them competently practiced after the implementation of the nursing program. From the researcher's perspective, this finding could be attributed to increased nurses' awareness about the complications of oxygen therapy (oxygen toxicity and alveolar collapse). Concerning nurses' practice about physiotherapy for children with pneumonia, the present study revealed that more than one-third of the studied nurses had competent practice about chest physiotherapy before the implementation of the nursing program.

Meanwhile, more than two-thirds of them are competent practitioners after the implementation of the nursing program. Such a result was agreed upon by Kaynar et al., (2019), who conducted a study about "Attitudes of respiratory therapists and nurses about measures to prevent pneumonia" and reported that more than two-thirds of them competently practiced after the implementation of a nursing program [23]. From the researcher's perspective, this could be attributed to the effectiveness of the practical sessions given by the researcher. Regarding measuring vital signs, the present study showed that less than half of the studied nurses' competent practices about vital signs existed before the implementation of the nursing program, while more than two-thirds of them had competent practices after the implementation of the nursing program. Such a result came in line with Black (2017) [24]. Who conducted a study about "Which symptoms and clinical features correctly identify serious respiratory infection in children attending pediatric units?" From the researcher's perspective, this revealed that measuring vital signs is a basic nursing role and responsibility. Regarding nurses' practice about suctioning technique for children with pneumonia, the present study revealed that less than half of the studied nurses had competent practice about suctioning technique before the implementation of the nursing program. Meanwhile, more than three-quarters of them had competent practice after the implementation of the nursing program. This finding was agreed upon by Ahmed (2016), who conducted a study about the "Effect of Nursing Care Protocol on the Reduction of Ventilator-Associated Pneumonia" and reported that three-quarters of them had competent practice after the implementation of the nursing program.

From the researcher's point of view, it might be due to the effectiveness of the practical session of the protocol of care. Regarding nursing practices about hand washing, the present study revealed that slightly more than two-thirds of the studied nurses had competent practices about hand washing before the implementation of the nursing program. Meanwhile, the majority of them have competent practice after the implementation of the nursing program. Such a finding was consistent with Luby (2016), who conducted a study about "the effect of hand washing on children's health" [25]. The study revealed that hand washing wasn't followed in most procedures

for children before training program application. From the researcher's perspective, this result on the pretest could be due to a deficiency of supplies, nurses work overload, or carelessness. Concerning nursing practices about nasogastric tube insertion, the present study revealed that slightly more than half of the studied nurses' competent practices existed before the implementation of the nursing program. Meanwhile, more than three-quarters of them had competent practices after the implementation of the nursing program. Such findings came in line with Kamar et al., (2018), who conducted a study about the "Effect of a Nursing Care Protocol on the Duration of Hospitalization of Children with Pneumonia." From the researcher's point of view, this could be due to increasing nurses' awareness and skills about the importance of nasogastric tubes for feeding and minimizing abdominal pressure after adherence to the nursing care program. In relation to the mean total score of nurses' practices regarding the care of children with pneumonia on the pre- and post-program, the present study clarified that the studied nurses had a higher mean total score on the post-program than on the pre-program.

Such a result revealed that the mean total score of nurses' practices increased post-program rather than pre-program [26]. From the researcher's point of view, this could be attributed to the nurse's ability to provide standardized nursing care after having a well-prepared practical educational program. Concerning the Pearson correlation between total knowledge

and total practice scores of studied nurses, it was clear that there was a positive correlation between total nurses' knowledge and total nurses practice scores after the implementation of the nursing program. Such findings agree with Kamar et al., (2018), who conducted a study about the "Effect of a Nursing Care Protocol on the Duration of Hospitalization of Children with Pneumonia." The finding was that there was a positive correlation between the total nurse's knowledge and the total nurse's practice scores after adherence to the training program. From the researcher's perspective, such findings could be attributed to the importance of a continuous training program for nurses about pneumonia [27]. To summarize, the mean of nurses' knowledge and practice improved tremendously after the program's implementation, and there were significant differences between pre- and post-intervention. This reflects the effect and importance of the program of care for nurses. Also, the use of audiovisual material, handouts, and illustration aids helped in the success of the program of care and improved nurses' knowledge and practices about nursing care provided for children with pneumonia. These results support the proposed hypothesis of the present study.

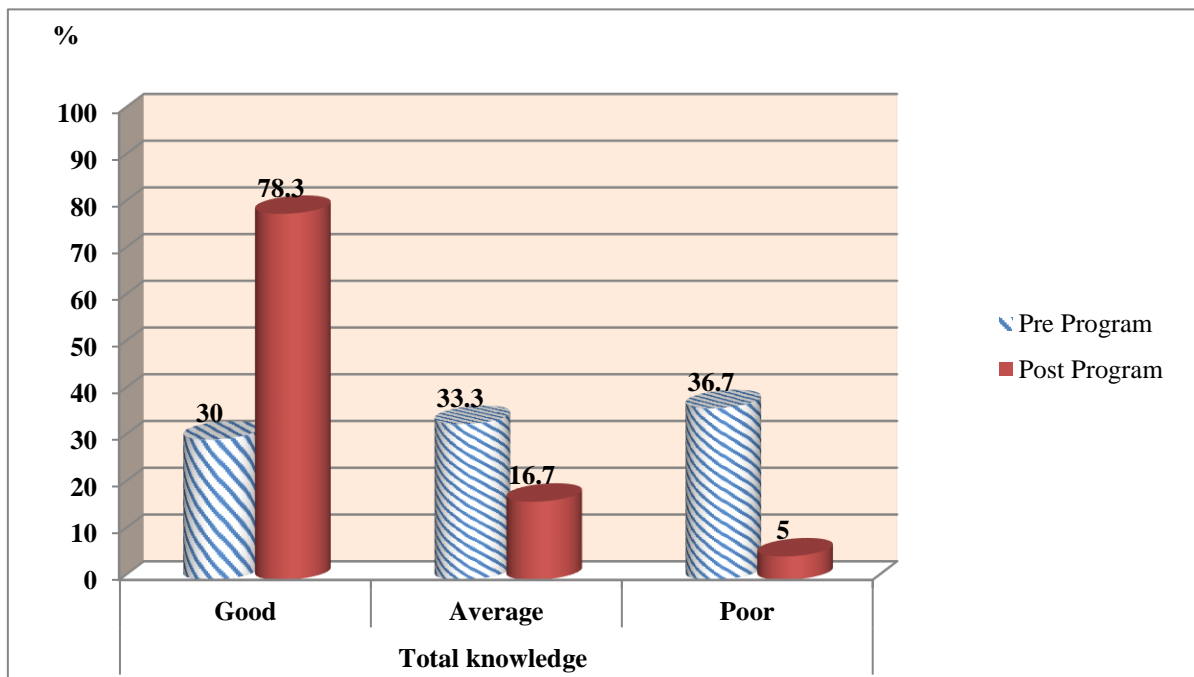


Figure 1: Percentage distribution of the studied Nurses' total knowledge about caring of children with pneumonia (pre/ post) implementation of nursing program.

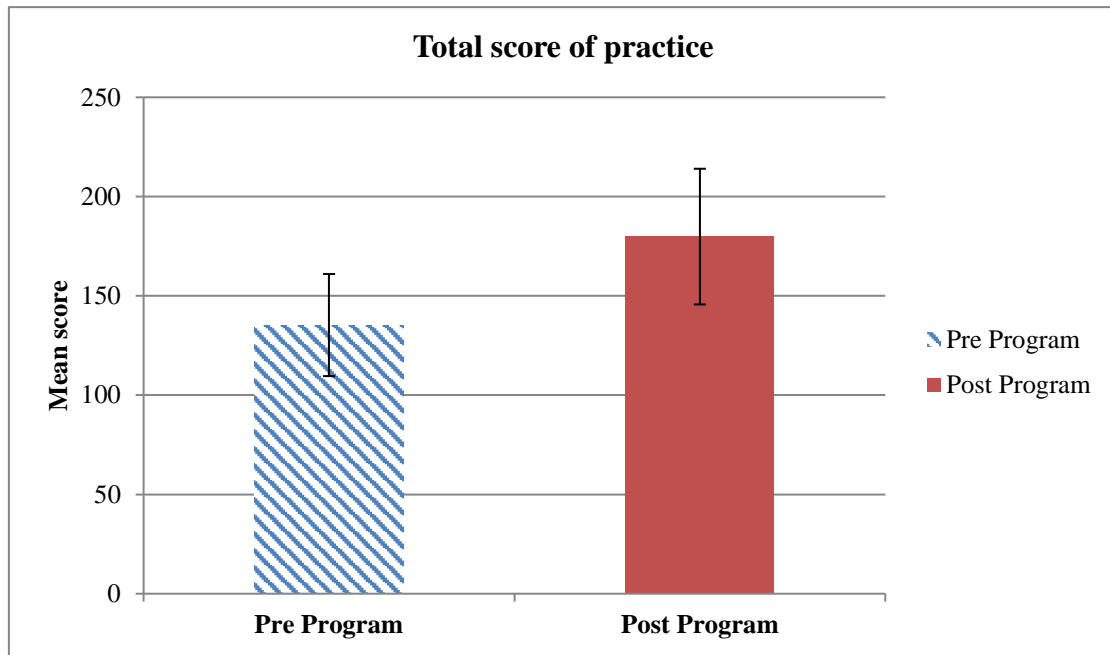


Figure 2: Comparison between total mean scores of the practice about caring of children with pneumonia (pre/post) implementation of nursing program.

Table 1: Distribution of demographic characteristics for the studied nurses (n=60).

Items	No.	%
Age (years)		
<20 years	5	8.3
20<30 years	45	75.0
30≤40 years	10	16.7
Mean±SD	26.08±4.43	
Gender		
Male	20	33.3
Female	40	66.7
Job position		
Staff nurse	50	83.3
Supervisor nurse	10	16.7
Nursing qualification		
Diploma in nursing	5	8.3
Technical Institute diploma	15	25.0
Specialty diploma	30	50.0
Bachelor degree	10	16.7
Years of experience		
1-<5 year	45	75.0
5-<10 years	10	16.7
≥10 years	5	8.3
Mean±SD	4.68±2.77	
Attending Previous Training Course		
Yes	0	0.0
No	60	100.0

Table 2: Distribution of the studied Nurses' knowledge regarding to definition, common season and mode of transmission of pneumonia (pre/ post) implementation of nursing program (n=60).

Items	Pre- Program						Post Program						x ²	p-value
	Good		Average		Poor		Good		Average		Poor			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Definition of pneumonia	28	46.7	22	36.7	10	16.7	44	73.3	13	21.7	3	5.0	9.639	0.008*
Common season	28	46.7	24	40.0	8	13.3	43	71.7	13	21.7	4	6.7	7.773	0.021*
Mode of transmission	19	31.7	26	43.3	15	25.0	40	66.7	13	21.7	7	11.7	14.717	<0.001**
Types of pneumonia	22	36.7	25	41.7	13	21.7	42	70.0	15	25.0	3	5.0	15.000	<0.001**
Etiology of pneumonia	14	23.3	32	53.3	14	23.3	39	65.0	15	25.0	6	10.0	21.141	<0.001**
Predisposing factor	28	46.7	19	31.7	13	21.7	46	76.7	7	11.7	7	11.7	11.717	0.003*
Sign and symptoms of pneumonia	35	58.3	18	30.0	7	11.7	49	81.7	8	13.3	3	5.0	7.779	0.021*
Investigation of pneumonia	32	53.3	20	33.3	8	13.3	50	83.3	6	10.0	4	6.7	12.823	0.002*
Complication of pneumonia	26	43.3	21	35.0	13	21.7	41	68.3	10	16.7	9	15.0	7.989	0.018*
Treatment of pneumonia	25	41.7	21	35.0	14	23.3	41	68.3	10	16.7	9	15.0	8.869	0.012*
Prevention of pneumonia	22	36.7	24	40.0	14	23.3	38	63.3	18	30.0	4	6.7	10.679	0.005*
Purpose of nursing care	23	38.3	21	35.0	16	26.7	41	68.3	13	21.7	6	10.0	11.490	0.003*
Daily nursing care	14	23.3	25	41.7	21	35.0	34	56.7	16	26.7	10	16.7	14.212	<0.001**
Health education family and child with pneumonia	19	31.7	17	28.3	24	40.0	38	63.3	17	28.3	5	8.3	18.782	<0.001**
Oxygen therapy	25	41.7	21	35.0	14	23.3	45	61.7	9	26.7	6	11.7	13.714	<0.001**
Suction	22	36.7	15	25.0	23	38.3	44	73.3	10	16.7	6	10.0	18.299	<0.001**
Chest physiotherapy	20	33.3	13	21.7	27	45.0	34	56.7	14	23.3	12	20.0	9.436	0.009*
IV therapy	19	31.7	23	38.3	18	30.0	43	71.7	11	18.3	6	10.0	19.526	<0.001**

Table 3: Comparison between total and sub-total mean scores of the practice about caring of children with pneumonia (pre/post) implementation of nursing program (n=60).

Domains of practice	Pre- Program	Post Program	Paired sample t-test	
			t-test	p-value
Oxygen therapy	26.70±5.07	31.20±5.93	8.733	<0.001**
Physiotherapy	8.40±1.60	10.10±1.92	7.349	<0.001**
IV therapy	10.93±2.08	13.73±2.61	9.116	<0.001**
Vital signs	47.03±8.94	57.80±10.98	5.523	<0.001**
Suctioning	22.93±4.36	28.27±5.37	7.173	<0.001**
Hand washing	9.80±1.86	11.60±2.20	3.105	<0.001**
Naso-gastric tube insertion	16.87±3.20	19.62±3.73	8.435	<0.001**
Total score of practice	135.30±25.71	179.85±34.17	12.128	<0.001**

**p-value <0.001 HS

Table 4: Relation between total knowledge and total practice about caring of children with pneumonia at pre-program (n=60).

Total practice pre program	Total knowledge pre program						Total		Fisher's Exact	
	Good		Average		Poor					
	No.	%	No.	%	No.	%	No.	%	FE	p-value
Competent	8	44.4	7	35.0	7	31.8	22	36.7	0.716	0.699
Incompetent	10	55.6	13	65.0	15	68.2	38	63.3		
Total	18	100.0	20	100.0	22	100.0	60	100.0		

Using: Chi-square test & Fisher’s Exact test
 p-value>0.05 NS; *p-value <0.05 S; **p-value <0.001 HS

7. Conclusions

In light of the present study findings, it can be concluded that, before the implementation of the nursing program, the majority of nurses had a deficit in knowledge and an inadequate performance level related to the care of children with pneumonia. Meanwhile, after program implementation, nurses' knowledge and practice significantly improved, which reflects the importance of continuous and in-service education for nurses working in pediatric intensive care units.

8. Recommendations

Based on the previous findings and conclusion, the following recommendations are suggested:

- **Recommendations for clinical nursing practice**

New staff members in the PICU and medical field should be oriented to the standardized nursing care program to manage pneumonia. A continuous in-service education program should be designed and implemented to motivate nursing staff to achieve high levels of nursing care.

- **Recommendation for Nursing Education**

A nursing care program for pneumonic children should be part of a continuous nursing educational program. A nursing care program for pneumonia should be available for all nurses.

- **Recommendation for future nursing research**

Further studies in this field should be done with a larger sample size to evaluate the effect of nursing care programs on the length of hospitalization of children with pneumonia and to allow for the generalization of the findings.

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