

## The Effect of Applying Care Bundle on Nurses' Knowledge, Attitude, and Practice for Children Symptomatic COVID-19 under Hemodialysis



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### 1. ABSTRACT

**Background:** COVID-19 presents challenges for the management of children with chronic kidney disease and acute kidney injury requiring dialysis. Hemodialysis nurses play a pivotal role in the management of infection control at hemodialysis units. **Aim:** Evaluate the effect of applying the care bundle on nurses' knowledge, attitude, and practice for children symptomatic of COVID-19 under hemodialysis. **Research design:** A quasi-experimental (pre/post-test) design was utilized. **Setting:** This study was applied at the Pediatric Unit of Hemodialysis, Benha University Hospital. **Tools of data collection:** Tool (I): A Structured Interview Questionnaire: consists of part (1): characteristics of the studied nurses and part (2): Nurses' Knowledge Assessment regarding hemodialysis, COVID-19, and infection control measures. Tool II: Nurses' attitude toward children with Covid-19. Tool III: An Observational Checklist Sheet, adopted from the Center for Diseases Control and Prevention and the International Society of Nephrology to assess the nurses' performance regarding the care of children due to hemodialysis, and Tool (IV) for Child medical assessment. **Results:** The majority (88.6% & 71.4%) of studied nurses had a satisfactory level of knowledge at post and follow-up phases as compared to pre-implementing the care bundle, as well as most of them (92% & 80%) had a competent level of practice at post and follow-up phases. Regarding nurses' attitude, many of them (85% & 70%) show a positive level of attitude at post and follow-up implementation of the care bundle as compared to pre-implementation phase. **Conclusion:** Applying the bundle of care effectively improved the studied nurses' knowledge, attitude, and practice regarding the care of children symptomatic with COVID-19 under hemodialysis at the post and follow-up phases compared to pre-phase. **Recommendation:** Continuous in-service training regarding applying bundle of care on nurses' knowledge, attitude, and practice for children symptomatic with COVID-19 under hemodialysis with periodic follow-up is urgently needed.

**Keywords:** Care Bundle, Children Symptomatic Covid-19, Hemodialysis, Nurses' Knowledge, Attitude, and Practice

### 2. Introduction:

Around the world, hemodialysis (HD) is the best choice for the treatment of renal failure. Dialysis is a process in which blood is purified using a machine and a particular filter known as an artificial kidney, through its types of hemodialysis and peritoneal dialysis. Children undergoing dialysis are at increased risk of Covid-19 virus infection. Specific measures should be taken in hospital dialysis facilities to prevent the spread of illness to patients and the dialysis personnel caring for children. Regardless of the results of COVID-19, hemodialysis must be continued in children (Al-Hwiesh et al., 2021).

The recent type of the coronavirus family causes a severe and quickly spreading sickness known as COVID-19, dry cough, myalgia, and dyspnea are frequent symptoms; the disease's severity ranges from mild to severe to life-threatening. Clinical manifestations of COVID-19 in children on hemodialysis tend to be moderate, and the infection is not likely to develop into life-threatening pneumonia because of their

compromised cellular immune function and inability to create a cytokine storm (Shen et al., 2020).

As regards, the most prevalent features of Covid-19 in hospitalized children are fever, nausea/vomiting, cough, shortness of breath, and upper respiratory symptoms. There may be overlaps between coronavirus illness and other viral diseases like the flu or other respiratory or gastrointestinal viruses. Children with preexisting medical disorders, especially those with chronic renal failure and other chronic diseases, account for a disproportionate number of fatal instances of pediatric COVID-19 (Castagnoli et al., 2020).

There is a higher death rate and greater medical burden for children on hemodialysis compared to those who do not need it. COVID-19 infection is associated with an increased risk of severe illness and death in children with End-Stage Renal Disease (ESRD), because of the high prevalence of other chronic systemic disorders, such as hypertension, diabetes, and cardiovascular

disease. COVID-19 sophisticates the care of children with renal disorders, such as those who have had a kidney transplant, have chronic kidney disease, or have experienced acute kidney damage necessitating dialysis, and are thus taking immunosuppressive drugs for the long term. Prevention, protection, screening, and isolation are all crucial in the early stages of management (Akbarialiabad et al., 2020).

The care bundle method is a package of related therapies for treating a specific medical problem. To enhance nursing procedures and pediatric patient outcomes, they are included in the creation of nursing protocols for the treatment of complex clinical illnesses. Care bundles are used to guarantee that at least the baseline level of care is provided, and its components are best practices supported by research (Lavallée et al., 2017). Additionally, The CDC has provided evidence-based preventive packages that include nurses and training in addition to infection control measures. Care bundles may help make sure that pediatric hemodialysis patients get the nurse attention they need and that all the necessary infection-prevention precautions are taken (CDC, 2017).

Gama, et al., (2021) stated that care management, organizational action, the direction of technical and auxiliary operations, and a dedication to caring quality are all areas in which hemodialysis unit nurses play an essential role. Hemodialysis pediatric patients rely heavily on the assistance of nurses, who must be abreast of developments in routine precautions, COVID-19 transmission, and preventative strategies.

To confirm the Pediatric nurses' role the WHO, (2020) revealed the creation of interdisciplinary teams via their teaching and mentoring of service users, carers, and the public. They should instruct Pediatric patients on how to properly wash their hands, maintain social distancing, use disinfecting materials like alcohol, not shake hands, cover their mouths and noses with tissues when they cough or sneeze, and wear masks when they do so. In addition, they should be taught hand washing after encountering other people or after a bout of sneezing or coughing, and they should be discouraged from using the same towel or washcloth again.

Concerning the prevention of infection, pediatric nurses should remind parents of children with chronic kidney disease (CKD) to maintain at-home care sessions. Before and after each treatment, a 70% alcohol solution should be used to sanitize the dialysis equipment. Pediatric patients should stay in touch with their doctor or dialysis

nurse and report any signs of illness immediately, including fever, COVID-19 symptoms, or peritonitis. If a nurse is diagnosed with CKD and COVID-19 suspected, they should be sent to an isolation unit or a hospital specifically equipped to treat the virus as quickly as feasible (Schwierzeck et al., 2020).

Children and their caretakers should be taught preventative measures against the spread of COVID-19, including proper hand washing, breathing techniques, cough etiquette, mask usage, and trash disposal. Each time a pediatric patient comes for hemodialysis, the nurse is required to do a structured interview with the child and his or her caretaker to learn about any recent illnesses, including fever, cough, or breathing problems, as well as any possible exposure of the pediatric patient to COVID-19 (Zhong et al., 2020). Only one adult should be present at a time with the child, and that person should wear a facemask. Dialysis beds should be at least 2 meters apart to provide enough room during dialysis and cleaning. Before beginning dialysis, pediatric patients should be taught to clean their hands and fistula arms. It's important to properly treat and disinfect puncture wounds. When dealing with contaminated patients' laundry, use disposable gloves. To prevent the virus from spreading via the air, dirty clothes should not be shaken. Linens should be changed between shifts, and soiled ones should be disposed of in specially designated bins. After one usage, disposable gowns should be thrown away (McQuerry et al., 2021).

### **2.1 Significance of the study**

COVID-19-related mortality was 0.7% in the overall pediatric population and as high as 3.5% in children with preexisting renal disease, much lower than the adult population. According to the CDC (2014), there are 264 dialysis patients per 1,000,000 people in Egypt. The prevalence of dialysis in Egypt is stated to be 0.61 per 1000 persons in 2019, with an estimated incidence of 0.19 per 1000 people (Fadel et al., 2022).

In December 2019, China saw an epidemic of a previously unknown coronavirus. As soon as news of its worldwide spread began to surface, WHO labeled it a pandemic and a public health emergency of international concern. Since the first case was reported on February 11, 2020, an increasing number of cases have been reported in Egypt (Mostafa, et al., 2020).

Coronavirus infections may start with silent symptoms to severe illness or even death. Kidney failure patients' impaired immune systems and

frequent hospitalizations put them at high risk for contracting infectious illnesses like Covid-19. Hemodialysis-treated children with renal disease are more prone to have problems. When a patient is receiving hemodialysis, the nurse oversees ensuring that they get care to help prevent problems (Farag, Y. M., & El-Sayed, E. (2022). Therefore, the purpose of this research was to evaluate the effect of applying the care bundle on nurses' knowledge, attitude, and practice for children symptomatic Covid-19 under hemodialysis.

### 2.2 Aim of the study

The study's aim was to evaluate the effect of applying the care bundle on nurses' knowledge, attitude, and practice for children symptomatic Covid-19 under hemodialysis.

### 2.3 Research Hypothesis

1. Nurses' knowledge will be improved after applying the care bundle for children symptomatic with Covid-19 under hemodialysis.
2. Nurses' attitudes will be improved after applying care bundle for children symptomatic with COVID-19 under hemodialysis.
3. Nurses' Practice will be improved after applying the care bundle for children symptomatic with Covid-19 under hemodialysis.

## 3 Subject and Methods

### 3.1 Research design

The current study utilized a quasi-experimental (one-group pretest-posttest) design.

### 3.2 Research Settings

The research was conducted at **Benha** University Hospital's Pediatric Hemodialysis Unit, which consisted of two rooms, every one composed of eight hemodialysis machines.

### 3.3 Subjects

The subjects of this study:

**Nurses** who work in the study setting have participated in research regardless of their background or preferences.

**Children** between the ages of 6 and 12, receiving hemodialysis, have symptoms of Covid-19 infection and have no other serious medical conditions or recent surgical operations. Those children came from the indicated environment and were chosen for research participation during the

assessment phase of the research, which took about one month.

### 3.4 Sampling

1. A convenient sample of (35) nurses agreed to participate in the research. Of all nurses who work at the Pediatric Hemodialysis Unit 37 two of them have childcare leave.
2. A Purposive sample of (40) children undergoing hemodialysis and suspected or confirmed COVID-19 infection was chosen from the previously mentioned.

### 3.5 Tools of data collection

After looking at studies from across the world, the researchers decided to employ three methods to gather their data. These methods were:

#### **Tool (I): A Structured Interviewing Questionnaire (pre & post)**

Based on previous studies (CDC 2021; Elpasiony et al. 2021; WHO 2020), this instrument was developed to test nurses' information with the management of symptomatic COVID-19 in hemodialysis-treated children. The study's instruments, which were used twice in the before, and after applying the care bundle on nurses' knowledge, attitude, and practice for children symptomatic with COVID-19 while on hemodialysis, were prepared in Arabic to accommodate the nurses' level of comprehension.

**Part (1): Characteristics of the studied nurses:** data related to their age, gender, educational level, work title, years of experience in the pediatric hemodialysis department, and sources of information regarding COVID-19 illness.

#### **Part (2): Nurses' Knowledge Assessment Format**

This part consisted of (28) multiple-choice questions as the following:

#### **A) Nurses' Knowledge regarding hemodialysis**

The first partition focuses on testing nurses' hemodialysis information. Eleven items were covered: what CRF means, its causes, signs, and symptoms, and how it's investigated and managed. Additionally, define hemodialysis, why it's done, its complications, and what nursing care is needed before, during, and after the hemodialysis session.

#### **B) Nurses' Knowledge regarding Covid-19**

The second partition is dedicated to testing nurses' familiarity with Covid-19. There was a total of 9 questions on pediatric COVID-19 nursing care, including those related to diagnosis, treatment, and prevention.

### C) Nurses' Knowledge regarding infection control and prevention

In the third partition, we'll discuss how to test nurses' understanding of infection prevention. Nosocomial infection, infection control, isolation, and eight other related questions were included. Nosocomial infection risk factors, high-risk populations, aseptic technique, conventional precautions in the hemodialysis unit, and the role of the nurse in preventing infections.

#### Scoring system of knowledge

The examined nurses' knowledge was verified using a model key response, and therefore, the right answer was given (1) points, while the erroneous answer was given (0) scores. The evaluation of the nurses' knowledge occurred after the completion of the interview questionnaire. It was determined that the nurses' knowledge was good when the percent was 75% or higher (ranging from 21 to 28 points), and it was determined that the nurses' knowledge was unsatisfactory if the score was less than 75% (less than 21 points).

**Tool II: Nurses' attitude toward children symptomatic COVID-19:** Was modified from a standardized rating scale based on the Likert-type format by Shawahna, (2021). It was utilized as a tool to evaluate nurses' perspectives on how best to care for children receiving hemodialysis who had signs of COVID-19. It consisted of 17 questions, each of which was scored on a Likert scale from 1 to 5 (Do you inform patients about covid 19, as a healthcare worker, are you afraid of becoming infected with covid 19, did you need to quarantine yourself, and as a healthcare worker, are you afraid infecting Covid-19 to your family or people around you?). The survey was conducted in English. A score of five was given for strongly agreeing, a score of four for agreeing, a score of three for neutral, a score of two for disagreeing, and a score of one for severely disagreeing. In the meanwhile, the scores were sorted into three categories: positive attitude (ranging from 68 to 85 points for 80% to 100%), neutral attitude (ranging from 51 to 67 points for 60% to 80%), and negative attitude (ranging from less than 60% to fewer than 51 points for less than 60%).

#### Tool III: An observational checklist

This instrument, which was developed by the Centers for Disease Control and Prevention (2017) and the International Society of Nephrology (Aylward et al., 2021), is what the researchers use to evaluate the nurses' abilities to care for children who are getting hemodialysis treatment. The tool was used three times during the pre-, post-, and

follow-up three-month periods, during which the care bundle phases were applied. These phases contained a total of 35 steps that were categorized into the following three primary domains:

**First domain: Nursing Staff (11 steps) in the areas related to;** personal protective equipment (PPE) (N95 mask, cap, protective gown, shoes cover, gloves, and goggles or face shield (6 procedures), how to monitor the signs and symptoms of Covid-19, avoid discussions with children and their caregivers, avoid eating together, using virtual contact through telephone, video, or the internet, and consider distance between children and healthcare staff.

**The second domain of personal hemodialysis children (16 steps) is the field of;** maintenance of personal Protective equipment while in a hemodialysis facility, screening children for COVID-19 symptoms and signs before entering the HD facilities, isolating the positive or suspected children, and placing the children's seat and bed at a minimum distance of 1 meter. Moreover, children's education (11 steps): increasing children's knowledge regarding prevention of COVID-19 (methods of transmission, signs and symptoms of covid-19, complications, treatment, eating a safe and clean diet and avoiding eating while undergoing hemodialysis sessions, limiting visits, adequate rest and maintaining a happy mood to improve body immunity, hand hygiene should be washed frequently, a touch of eyes, nose and mouth should be avoided, avoid close contact with sick people and handshake and kiss must be avoided.

**The third domain: regarding maintenance of dialysis facilities (8 steps) in the areas related to;** the use of chlorine disinfectant process in the dialysis facility area, providing masks and hand sanitizers, minimizing crowding in the waiting room and staff room, good ventilation, and air conditioning to remove particles and droplets from the air. Furthermore, it deals with blood, body secretions, fluids, and sharp objects. Maintaining a clean environment and safe injection practices. Dialysis machines and supplies should remain in the isolation area between dialysis sessions.

#### Scoring system of practice

The grading system assigned a score of one (1) for completed work and a score of zero (0) for work that was not completed for each item. The scores ranged from zero (0) to one (1). It was determined that the nurses' practice was competent if the percent score was 85% or higher (ranges from 30 to 35 marks), and it was determined that

the nurses' practice was incompetent if the score was less than 85% (less than 30 marks).

**Tool (IV): Child medical assessment sheet**

The researchers used this tool in the pre-applying care bundle to assess children's current medical condition. The tool consisted of two parts:

**Part (a): Characteristics of the studied children** such as age, gender, and birth order.

**Part (b):** The most recent medical data collected from the children who were the subject of this study included the following information: history of hemodialysis, length, number of hemodialysis sessions per week, duration of hemodialysis session, primary complaint linked to Covid-19, and duration of complaint. The researcher used the hospital medical records of children who were having hemodialysis to compile the most recent medical information on the children who were examined.

**II - Operational Design**

The operational design included the preparatory phase, content validity, reliability of the tools, pilot study, and fieldwork.

**Preparatory Phase**

During this phase, the researchers reviewed the relevant literature and various studies related to hemodialysis, COVID-19, and theoretical knowledge of various aspects of the study. We developed the tools and became familiar with the various study aspects of the research problem by using textbooks, evidence-based articles, the internet, periodicals, and journals.

**Content validity**

The validity of the tools was evaluated by a panel consisting of three experts (professors) in pediatric nursing from the faculties of Benha University, El-Menofia University, and Benha University. The purpose of the evaluation was to evaluate the content validity of the instruments as well as their level of clarity, comprehensiveness, relevance, simplicity, and correctness. All of their comments were taken into consideration. To arrive at the final version of the tools, several of the elements under consideration underwent rephrasing. According to the opinions of the knowledgeable individuals, the instruments were reliable.

**Reliability of the tools**

Concerning the reliability of the tools, the researchers used Cronbach's coefficient alpha to evaluate the internal consistency of each component of the instruments. This came out to be 0.83 for the knowledge evaluation questionnaire

that was used to evaluate the nurses' knowledge. The reliability of the nurse's attitude was found to have a value of 0.79. An observational checklist sheet has a reliability rating that varies from 0.97 to 0.99 overall.

**3.6 Ethical Considerations**

The researchers go through the process of getting the study approved from the Ethics Committee at the Benha University's Faculty of Nursing. During the first interview, the researchers provided all nurses who were examined with further information on the purpose of the study, as well as the anticipated results. The participants in the present research provided the researchers with their verbal consent. It was made clear to the people who were being observed (nurses and the parents of the children who were being seen) that all information would be kept in strict confidence, and they were given the option to withdraw from the research without providing reasons.

**3.7 Pilot Study**

A pilot study consisting of ten percent of the entire study sample (three nurses and four children) was carried out to evaluate the practicability of the research procedure, as well as the reliability, clarity, and usefulness of the instruments. Since the research instruments did not undergo any significant changes over the course of the investigation, the participants in the research were able to be counted as part of the research sample. It was also helpful in estimating how much time would be required to gather the necessary data, which ranged from 25 to 35 minutes.

**Field Work**

To accomplish the purpose of the present investigation, the stages of assessment, planning, execution, and evaluation were each carried out. The researchers described these stages as beginning as early as October 2021 and going all the way through the end of March 2022, a span of time that encompasses four months. Before beginning their data collection, the researchers at Benha University ensure that they have received formal approval from both the Nursing Faculty' Dean and Benha University Hospital' Director.

**Assessment phase**

For obtaining the baseline data, the evaluation phase consisted of conducting interviews with nurses who were engaged in the research. First, the investigators went to Benha University Hospital in Benha City on three different days each week on a rotating schedule. Their morning shift began at 10 AM and lasted until 2 PM, while their evening shift began at 3 PM

and lasted until 6 PM. The researchers greeted the nurses at the beginning of the interview, discussed the aim of the study, the length of the study, and the activities that would be included, and then obtained their verbal consent to take part in the study before commencing data collection. After that, the researchers provided the nurses who were being investigated with a structured interviewing questionnaire format to complete, so that they could be evaluated on their knowledge of hemodialysis, Covid-19, and infection control measures. It took almost exactly half an hour. After that, the researchers used an observational checklist style to evaluate the nurses' real practices and then determined the mean score based on the observations that they made of the nurses' performance three times throughout the same shift. It took somewhere between 30 and 40 minutes. In the end, the researchers spent roughly fifteen minutes retrieving the medical evaluation form for the youngster from the medical data kept at the hospital. The pre-testing phase lasted for a total of one month.

#### **Planning phase**

The researchers built the care package to meet the requirements of the examined nurses by considering the data they gathered during the evaluation phase, as well as the findings of relevant literature studies. To enhance the nurses' knowledge, attitude, and performance in relation to hemodialysis and COVID-19, a care bundle was developed, edited, and adjusted using the relevant literature. In addition, the researchers used a variety of instructional strategies, including customized lectures, group discussions, brainstorming and demonstration, and re-demonstration. For the presentation of the data, several formats such as booklets and real-life scenarios were employed. This phase lasted one month, November 2021 for the building of the care bundle.

#### **General objective**

The primary objective of this study was to evaluate the effect of applying the care bundle on nurses' knowledge, attitude, and practice for children symptomatic Covid-19 under hemodialysis.

#### **Specific objectives**

At the end of this educational program, the studied nurses should be able to:

#### **A-Knowledge about chronic renal failure in areas related to**

- Define chronic renal failure.
- Identify causes of chronic renal failure

- Enumerate clinical manifestation of chronic renal failure.
- List investigation of chronic renal failure
- Discuss management of chronic renal failure

#### **B-Knowledge and performance about the hemodialysis**

- Define hemodialysis.
- Illustrate indication of hemodialysis
- Enumerate complications of hemodialysis
- Apply nursing care before, during, and after the hemodialysis session.

#### **C-Knowledge and performance about the Covid-19**

- Define Covid-19
- List causes of Covid-19
- Enumerate modes of transmission of Covid-19
- Identify incubation period of Covid-19
- Identify clinical manifestations of Covid-19
- Outline investigation of Covid-19
- State complications of covid19
- Discuss management for children with Covid-19
- Demonstrate nursing care for children with Covid-19

#### **D- Knowledge and performance about infection control and prevention:**

- Define nosocomial infection.
- Define infection control.
- Define isolation.
- List factors influencing the development of nosocomial infections.
- Outline the common high-risk group.
- Apply principles of aseptic technique measures used to prevent infection transmission.
- Perform standard precautions in the hemodialysis unit.
- Discuss nursing responsibilities to prevent infection.

#### **Implementation phase**

**This phase took about three months from the beginning of December 2021 to the end of February 2022.**

Sessions were used to go through the implementation phase of the care bundle; each session began with a review of the previous session and an explanation of the goals for the current

session. The researchers did, however, consider the usage of the Arabic language that was appropriate for all levels of educational attainment among the nurses. In addition, to encourage more sharing among participants in the study, the researchers distributed little presents as a kind of encouragement and reinforcement while the sessions were in progress.

The nurses who participated in the research were split into six groups, with five to six nurses in each group. The overall number of sessions came to seven, and they were broken up as follows: (4) sessions for the theoretical component, where each session took about 45 minutes, and (3) sessions for the practical component of the care bundle, where each session took about 60 minutes and was presented to each group two times.

**The components of the care bundle were two parts as follows:**

**a. The theoretical part consisted of four sessions**

- **The first session of the care bundle included:** definition of chronic renal failure, causes of chronic renal failure, clinical manifestation of chronic renal failure, investigation of chronic renal failure, and management of chronic renal failure.
- **The second session included:** definition of hemodialysis, indications of hemodialysis, complications of hemodialysis, and nursing care pre, post and follow-up the hemodialysis session.
- **The third session composed:** definition of Covid-19, its causes, modes of transmission, incubation period, clinical manifestations, investigations, complications, management, and nursing care for children with Covid-19.
- **The fourth session involved:** definition of nosocomial infection, infection control, isolation, factors influencing the development of nosocomial infections, the common high-risk group, principles of aseptic technique measures, standard precautions in hemodialysis unit, and nursing responsibilities to prevent infection.

**b. The practical part consisted of three sessions for three domains related to the bundle of nursing care**

The first domain is related to nursing staff, the second domain is related to hemodialysis children, and the third domain is regarding the maintenance of hemodialysis facilities.

**The First session for nursing staff;** included the demonstration of personal protective equipment (PPE) procedures: (N95 mask, cap, protective gown, shoes cover, gloves, and goggles or face shield (6 procedures), and how the nurses monitor the signs and symptoms of Covid-19.

**The second session for personal hemodialysis children:** involved the skills for maintenance of personal Protective equipment while in a hemodialysis facility, screening children for COVID-19 symptoms and signs before entering the HD facilities, isolating the positive or suspected children, and placing the children's seats and beds at a minimum distance. Also, the nurses educate children's knowledge regarding prevention of COVID-19.

**The third session for maintenance of dialysis facilities ved the skills about** chlorine disinfectant process in the dialysis facility area, providing masks and hand sanitizers, minimizing crowding in the waiting room and staff room, good ventilation, applying in deal with blood, body secretions, fluids, and sharp objects. Maintaining a clean environment and safe injection practices.

### **Evaluation phase**

This phase took about one month in March 2022. The researchers observed the performance of each nurse immediately and after three months of applying the bundle on morning and afternoon shifts. The duration of each observation ranged from twenty to thirty minutes.

### **III- Administrative Design**

The researchers got an official agreement from the Dean of the Faculty of Nursing Benha University to the hospital director and the head of the Pediatric Medicine department at Benha University Hospital. Moreover, they gave a clear explanation about the nature, importance, and expected outcomes of the study to carry out with minimal resistance.

### **IV- Statistical Design**

Statistical Package for the Social Science Software (SPSS) more recent version "20" was used for data collection, editing, organization, tabulation, and analysis. Quantitative data were tabulated using means, standard deviations (X SD), and t-tests applied to categories with normally distributed numeric variables. In contrast, chi-square and percentage were utilized to analyze qualitative data presented as frequency. Independent t-test, a parametric test of significance for comparing the means of two samples, was also

utilized. A P-value at 0.05 was used to determine the significance.

**4. Results**

The median age of nurses was 34.40±5.39 years, with over half being under the age of 35. Most of the nurses in the study were females (91.4%), and more than half (51%) of them had at least a certificate of completion from an accredited nursing program. Moreover, more than half (54.3%) of them had experience of less than 10 years, with a mean of 8.80±3.71 years.

**Table (1):** Clarified that 37.5% of studied children were in the age group 14- ≤18 years with mean age 11.47±3.74 years, 37.5% of them were in the secondary stage of education and 62.5 % of them were living in a rural area.

**Table (2):** 70 percent of the studied children were still on hemodialysis one to six years later. Seventy-five percent of them received three dialysis sessions each week, and more than 70% of them had dialysis sessions that lasted three hours.

**Table (3):** Demonstrated that the suspected symptoms of COVID-19 appeared within two days to less than 4 days in 32.5% of studied children. Fatigue, myalgia, cough, sore throat, shortness of breath, diarrhea, fever, vomiting, and anorexia were the suspected Covid-19 symptoms that the studied children suffered (95%, 87.5%, 80%, 77.5%, 75%, 67.5%, 62.5%, and 52.5% respectively)

**Table (4):** Showed a statistically significant improvement in nurses' understanding of renal failure, hemodialysis, COVID-19, and infection

prevention and control before and after implementing the care bundle.

**Table (5):** Provided evidence and explanation demonstrating that after implementing the care bundle, nurses significantly improved their performance in three areas of care delivery compared to their pre-care bundle performance (P= 0.001).

**Table (6):** Results showed that the research group's overall knowledge, attitude, and practice score improved significantly before, during, and after the implementation of the care bundle (P= 0.001).

**Table (7)** clarified that there were significant correlations found between the three variables in the study phases pre, post, and follow-up implementation of the care bundle related knowledge-practices, knowledge-attitude, and attitude-practice.

**Figure (1):** Compared to before the care bundle was implemented, nurses' levels of knowledge were significantly higher throughout the post- and follow-up phases (88.6% and & 71.4%, respectively).

**Figure (2):** Findings indicated that, after implementing the care bundle, a greater proportion of nurses (92 percent and 80 percent, respectively) exhibited competent levels of practice.

**Figure (3):** Data showed that after implementing the care bundle, nurses' attitudes improved, with 85% and 70%, respectively, compared to the pre-implementation phase.

**Results**

**Table (1): Distribution of the studied children according to their characteristics (n =40).**

Children' Characteristics	No.	%
<b>Age in years</b>		
5- <8	7	17.5
8- <11	13	32.5
11- <14	5	12.5
14- ≤18	15	<b>37.5</b>
<b>Mean ± SD</b>	<b>11.47±3.74</b>	
<b>Gender</b>		
Boys	24	60%
Girls	12	40%
<b>Education</b>		
Illiterate	12	30.0
Primary	8	20.0
Preparatory	5	12.5
Secondary	15	37.5
<b>Residence</b>		
Rural	25	<b>62.5</b>
Urban	15	37.5

Table (2): Frequency distribution of the studied children regarding their hemodialysis data (n=40).

Items	No	%
<b>Duration of hemodialysis (years)</b>		
▪ < 1 year	5	12.5
▪ 1- < 6years	28	70.0
▪ 6- ≥ 10 years	7	17.5
<b>Mean ± SD</b>	4.25±2.35	
<b>Number of hemodialysis sessions per week</b>		
▪ 3 sessions	30	75.0
▪ 4 sessions	10	25.0
<b>Duration of the hemodialysis session</b>		
▪ 3 hours	28	70.0
▪ 4 hours	12	30.0

Table (3): Distribution of the studied children regarding their present complaints due to suspected symptoms of COVID-19 (n=40).

Present complains	No.	%
<b>The onset of Covid-19 symptoms</b>		
Since one day- < 2 day	12	30.0
2-<4 day	13	<b>32.5</b>
4-<6 day	8	20.0
6-≤8 day	7	17.5
<b>Mean ± SD</b>	2.32 ± 1.91 days	
<b>Suspected Covid-19 symptoms</b>		
<b>Fatigue</b>	38	<b>95.0</b>
Yes	2	5.0
No		
<b>Myalgia</b>		
Yes	35	<b>87.5</b>
No	5	12.5
<b>Cough</b>		
Yes	32	<b>80.0</b>
No	8	20.0
<b>Shortness of breath</b>		
Yes	31	<b>77.5</b>
No	9	22.5
<b>Sore throat</b>		
Yes	30	<b>75.0</b>
No	10	25.0
<b>Diarrhea</b>		
Yes	27	<b>67.5</b>
No	13	32.5
<b>Fever</b>		
Yes	25	<b>62.5</b>
No	15	37.5
<b>Vomiting, Anorexia</b>		
Yes	21	<b>52.5</b>
No	19	47.5

**Table (4): Mean scores of studied nurses' knowledge about care of children symptomatic with Covid-19 under hemodialysis through the care bundle phases (n =35).**

Nurses' knowledge	Pre applying bundle	Post applying bundle	Paired t-test	P-value	Follow-up applying bundle	Paired t-test	P - value
	Mean $\pm$ SD	Mean $\pm$ SD			Mean $\pm$ SD		
Chronic renal failure and hemodialysis	4.20 $\pm$ 1.36	10.34 $\pm$ .725	21.59	0.00**	8.40 $\pm$ 1.51	12.53	0.00**
Coronavirus (Covid-19)	3.05 $\pm$ 1.90	7.97 $\pm$ 1.09	12.89	0.00**	6.45 $\pm$ 1.78	9.26	0.00**
Infection control	2.34 $\pm$ .968	7.08 $\pm$ .701	22.12	0.00**	5.65 $\pm$ 1.58	11.02	0.00**

\*\*A highly statistically significant difference ( $P \leq 0.001$ )

**Figure (1): Distribution of the total level of nurses' knowledge about the care of children symptomatic Covid-19 under hemodialysis through the care bundle phases (n =35).**

**Table (5): Mean scores of the studied nurses' attitude regarding care bundle for children symptomatic COVID-19 under hemodialysis (n =35).**

Nurses attitude	Pre-Applying Bundle	Post-Applying Bundle	Follow up Applying Bundle	F	P-value
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD		
I inform pediatric patients about Covid-19.	2.20 $\pm$ .71	4.48 $\pm$ .61	4.20 $\pm$ .632	126.0	0.000**
I am not afraid of becoming infected with Covid-19.	2.11 $\pm$ .72	4.46 $\pm$ .63	4.21 $\pm$ .631	136.3	0.000**
I need to quarantine myself.	2.17 $\pm$ .70	4.34 $\pm$ .72	4.11 $\pm$ .758	93.4	0.000**
I am not afraid of infected Covid-19 to my family or the people around me.	2.08 $\pm$ .71	4.31 $\pm$ .62	4.17 $\pm$ .617	128.4	0.000**
I think my psychology is not affected negatively by Covid-19.	2.22 $\pm$ .68	4.49 $\pm$ .56	4.16 $\pm$ .616	133.7	0.000**
I do not hesitate to treat or contact a pediatric patient who has come through after recovering Covid-19 infection.	2.24 $\pm$ .77	4.40 $\pm$ .69	4.05 $\pm$ .683	96.4	0.000**
I think that after the Covid-19 pandemic, I will be more careful in following standard measures regarding contamination.	2.40 $\pm$ .67	4.48 $\pm$ .61	4.14 $\pm$ .692	98.3	0.000**
I do not regret being a healthcare worker during the Covid-19 outbreak.	2.22 $\pm$ .68	4.48 $\pm$ .56	4.08 $\pm$ .657	124.3	0.000**
I am willing to raise my information related Covid-19.	2.37 $\pm$ .64	4.54 $\pm$ .50	4.07 $\pm$ .612	131.4	0.000**
I believe that all HCWs should apply measures of infection control by WHO to decrease the risk of infection	2.25 $\pm$ .70	4.60 $\pm$ .49	4.31 $\pm$ .631	150.9	0.000**
I think that following precautions of infection control could save from infection.	2.28 $\pm$ .66	4.51 $\pm$ .50	4.05 $\pm$ .591	138.2	0.000**
I suspect that engaging HCWs in infection control programs has a crucial role in minimizing the risk of infection.	2.34 $\pm$ .63	4.54 $\pm$ .54	4.17 $\pm$ .568	147.6	0.000**
I think that pediatric patients with Covid-19 should be isolated.	2.33 $\pm$ .62	4.48 $\pm$ .51	4.20 $\pm$ .677	126.4	0.000**
I believe that the pandemic may be controlled.	2.40 $\pm$ .60	4.54 $\pm$ .50	4.14 $\pm$ .601	138.8	0.000**
I am not fearful of being infected with Covid-19 at work.	2.41 $\pm$ .61	4.43 $\pm$ .56	4.05 $\pm$ .639	116.9	0.000**
I will report to the hospital director, and all concerned when I will be infected with virus of Covid-19	2.48 $\pm$ .63	4.51 $\pm$ .57	4.22 $\pm$ .598	141.0	0.000**
I agree to take the immunization against Covid-19	2.31 $\pm$ .62	4.45 $\pm$ .54	3.94 $\pm$ .539	130.9	0.000**
Total	41.14 $\pm$ 9.49	76.17 $\pm$ 7.89	70.34 $\pm$ 6.18	193.9	0.000**

\*\*A highly statistically significant difference ( $P \leq 0.001$ )

**Table (6): Distribution of studied nurses' total level of practice related to three domains of care for children symptomatic COVID-19 under hemodialysis through care bundle phases (n =35).**

Domains	Pre-Applying Bundle				Post-Applying Bundle				X <sup>2</sup> test FET	p	Follow-up Applying bundle				X <sup>2</sup> test FET	p
	Competent		Incompetent		Competent		Incompetent				Competent		Incompetent			
	No	%	No	%	No	%	No	%			No	%	No	%		
<b>First domain:</b> Nursing staff during care of children undergoing hemodialysis suspected or confirmed COVID-19	4	11.4	31	88.6	31	88.6	4	11.4	41.65	0.00	24	68.6	11	31.4	23.81	0.00
<b>Second domain:</b> Hemodialysis children suspected or confirmed COVID-19	5	14.3	30	85.7	32	91.4	3	8.6	41.79	0.00	27	77.1	8	22.9	27.86	0.00
<b>Third domain:</b> Maintenance of dialysis facilities during care of children undergoing hemodialysis suspected or confirmed	2	5.7	33	94.3	31	88.6	4	11.4	41.65	0.00	26	74.3	9	25.7	34.28	0.00

\*\*A highly statistically significant difference (P ≤ 0.001)

**Table (7): Correlation between the studied nurses' total knowledge, practice, and attitude through applying care bundle phases (n=35).**

Total scores	Pearson correlation coefficient					
	Pre-Applying Bundle		Post-Applying Bundle		Follow up Applying Bundle	
	r	P-value	r	P-value	r	P-value
Knowledge - practice	0.521	.001**	0.912	.000**	0.713	.000**
Knowledge - attitude	0.495	.003**	0.893	.000**	0.814	.000**
Attitude - practice	0.632	.000**	0.907	.000**	0.791	.000**

\*\* Correlation is significant at the 0.01 level (2- tailed).

### 5. Discussion

The spread of coronavirus has had a major effect on medical care. Clinical treatment for children with end-stage renal illness was complicated by the need to ensure the safety of both patients and medical personnel throughout the pandemic. When it comes to spreading germs in hospitals, it's usually the nurses who come into direct touch with patients, even young patients. Nurses are at a high risk of exposure during the Covid-19 outbreak due to their high occupational risk and high risk of exposure in providing care during the outbreak's prevention, infection control, isolation, and continuous children monitoring.

More than half of the nurses were in the age bracket 35 years, with a mean age of 34.40 5.39 years, according to the findings of the present research. Most of the nurses in the sample were female. Furthermore, about 50% of registered nurses have a diploma from an accredited nursing program. However, the majority of them (8.803.71) had less than 10 years of experience on average. Ahmed et al. (2020), who investigated the

"Effectiveness of a training program on nurses' knowledge and practice regarding postoperative nursing care for patients undergoing hemodialysis," found similar results, and our research agrees with their findings. According to the results, 88.0% of the participants were female. Participants had, on average, 8.5 years of clinical experience. Knowledge, Attitudes, and Practice of Nurses in Renal Dialysis Units in Abha City Regarding Infection Control" by Al Qahtani et al. (2017) is prior research to which this one refers. According to the results, about eighty percent of nurses have at least a diploma in nursing. Additionally, nurses in the dialysis unit have worked in the field for a median of 6 years (6.1+5.07).

The present research revealed that about seventy percent of children received three hemodialysis treatments per week, with an average length of 1.5 hours for each session. Results from research on "Novel coronavirus disease in hemodialysis patients" by Ma et al. (2020) corroborated the observation that most hemodialysis-dependent children had three

treatments per week. These results are consistent with those of Alberici et al. (2020), who conducted "a single center observational study of the clinical characteristics and short-term outcome of 20 kidneys," and discovered that many of the children they examined had hemodialysis three times per week.

Concerning nurses' levels of knowledge about renal failure, hemodialysis, COVID-19, and infection control before and after the implementation of the care bundle, the study findings clarified highly statistical difference ( $P=0.001$ ) as shown by the results of the current study. According to Nemati et al.'s (2020) research, "Assessment of Iranian nurses' knowledge and practice toward COVID-19 during the current outbreak in Iran," 80.4% of nurses had a satisfactory level of understanding following the implementation of educational guidelines, which is consistent with the present finding. There were statistically significant improvements in the nurses' knowledge of renal failure (15.535.56 vs. 32.273.36), hemodialysis (16.238.05 vs. 29.205.76), and the total knowledge (80.7018.48 vs. 174.8318.37) after the educational program. This study also agrees with Yousef et al. (2019), who studied the "effect of nursing educational program on knowledge and practice Ninety-six percent of the nurses had adequate levels of expertise.

Akalin et al. (2020) research "Covid-19 and kidney transplantation" found that, after receiving education, the majority of nurses had a solid grasp of the disease's origins, manifestations, vectors, causes, preventative measures, curative measures, and informational resources. According to Gan et al. (2020) research on "preventing intra-hospital infection and transmission of Covid-19 in healthcare workers," the vast majority of nurses (84.60%) practice infection prevention and control measures. Nurses represent excellent practice with respect to Covid-19, according to the researchers; this may be attributable to the nature of the study, the variety in the knowledge of individual healthcare providers, and the training that has been received with respect to Covid-19.

When comparing the nurses' understanding of the care bundle before and after they started working, the vast majority of those who were examined had a sufficient level of knowledge before they started working. According to Maheshwari et al. (2020) who stated that the nurses in their study had a median level of knowledge about Covid-19 (Mean=20.54, SD 4.67). Healthcare provider aspects also revealed that

participants had an extensive understanding of illness mechanisms and preventative actions. According to Zhong et al.'s (2020) research on "knowledge, attitudes, and practices towards Covid-19 among Chinese residents during the rapid rise period of the Covid-19 outbreak," study participants knew a moderate amount about how to intervene when dealing with suspected or confirmed cases of COVID-19 (average 8.65 2.27). In addition, the people in the research knew what they needed to know to prevent the spread of Covid-19 in their communities.

The majority of nurses in this research reported an improvement in their outlook from before to after implementing the care bundle. According to the findings of Wati et al. (2020) study, which examined nurses' "Knowledge, attitude, practice, perception, and psychological response" to Covid-19, "nurses have a positive attitude," with 88% of respondents saying they are confident in the eventual containment of the virus. Knowledge, attitude, and associated factors towards Covid-19 among nurses working in the South Gondar Zone were studied by Feleke et al. (2021), who found that 63.3% of respondents had a positive attitude towards Covid-19, while 36.7% had a negative one. Nurses had a generally positive outlook (63.3 percentage points, 95% confidence interval [CI] 54.3 to 72.1).

The majority of the nurses in this research showed an increase in their level of practice before and after implementing the care bundle. In line with the findings of atia Elasrag et al. (2021) study, which analyzed the "Impact of educational intervention on nurses' knowledge, practice, and attitude related prevention measures of Covid-19," the current research found that participants who had a positive attitude toward the virus put their newfound knowledge into action. This study also corroborated findings from Marthoenis and Maskur's (2021) research on nurses' "Knowledge, attitude, and practice" about Covid-19 prevention. There were statistically significant variations in nurses' practices as measured by the sum of their pre-and post-test scores. In the meanwhile, this was consistent with the findings of Koo et al. (2016), whose research on "Making infection prevention education interactive can enhance knowledge and improve outcomes" showed that nurses' performance improved after participating in CNE. This may be because nurses have better preventative knowledge, practice, and attitudes because of nursing education initiatives, especially during the pandemic.

The current study showed that there was a highly statistically significant difference (P value 0.001) between pre- and post-care bundle implementation total knowledge, attitude, and practice scores among the studied nurses. The majority of participants (77.4%) had good knowledge of Covid-19, and their mean scores of attitude toward Covid-19 were 33.0 2.7, and their good practices regarding Covid-19 (84.2%). This finding is consistent with the findings of Sahar et al. (2020), who studied "Coronavirus disease-19: public health nurses' knowledge, attitude, practices, and perceived barriers in Indonesia." Positive linear correlations were also found between the three variables in this study: knowledge, attitude, and practices ( $r = 0.435$ ,  $p = 0.000$ ); knowledge, attitude, and practices ( $r = 0.314$ ,  $p = 0.000$ ); and attitude, knowledge, and practices ( $r = 0.362$ ,  $p = 0.000$ ). Following the findings of Huynh et al. (2020), who found that "the majority of nurses had good knowledge of Covid-19," this research found that nurses had favorable views about, and good experiences with, the clinical decision support tool. This is consistent with findings by Alsahafi and Cheng (2020) that after receiving the training program, the vast majority of health personnel have excellent knowledge, favorable attitudes, and good behaviors connected to Covid-19. This result was also consistent with the findings of a research by Abdel Wahed et al. (2020), which examined healthcare personnel' knowledge, attitudes, and perceptions with respect to Covid-19 and found a favorable association between knowledge and attitude scores.

## 6. Conclusion

The current study found that compared to before the care bundle was implemented, nurses' knowledge, attitudes, and practices regarding children exhibiting symptoms of Covid-19 while receiving hemodialysis improved significantly during the post-care bundle implementation and follow-up phases. Meanwhile, the overall level of knowledge, attitude, and practice among the examined nurses was significantly higher throughout the post- and follow-up phases of using the care bundle compared to the pre-phase.

## 7. Recommendation

**Based on the findings of the current study, the following recommendations were deduced.**

To enhance the quality of treatment for children with chronic illness, the hospital is implementing a hospital-wide teaching program called Covid-19.

- The same research may be done with the parents of these kids to help them learn about infection prevention at home.
- Preventing and controlling Covid-19 among children with chronic diseases requires implementing a bundle of care for the virus in both inpatient and outpatient settings of the hospital before, during, and after various nursing and medical interventions.
- In order to continuously enhance nurses' abilities, it is advised that they conduct periodic follow-ups of the care package.

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