Effect of Using Clinical Pathway on Nursing Care

for Neonates with Sepsis

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Abstract:

Neonatal sepsis describes serious bacterial or viral infections that manifest in the first ٢٨ days of life, causing significant morbidity and mortality. Clinical pathway provide detailed guidance for each stage in the management of a patient whether adult or pediatric patient with a specific condition over a given time period and include progress and outcomes details. **The purpose of this study** was to determine the effect of clinical pathway on nursing care for neonates with sepsis. **A quasi-experimental design** was used. **This study was carried out at** neonatal intensive care units affiliated to Benha University Hospital and Benha Specialized Hospital of children and Benha Teaching Hospital at Benha city. **A convenient sample** of ١٤٠ nurses and A purposive sample of ١٤٠ neonates were included**. Three instruments** were used; A structured interviewing schedule, clinical pathway of care checklist and neonatal clinical outcome assessment sheet**. Results** of this study revealed that, there were improvement in feeding (normal feeding ٧٢.١ versus ٤٢.٨) C reactive protein test positive ١٤.٢ versus ٨٨.٥and shortness of length hospitalization ≥٣٠days ٧.٨ versus ٥٣.٥. **This study concluded that:** Implementation of the clinical pathway improved feeding, reduced length of hospitalization and decreased number of neonates having C reactive protein. **The study recommended that**: Clinical pathway should be followed by nurses who providing nursing care for neonates with sepsis at different settings.

Key words: Clinical pathway, nursing care, sepsis.

Introduction

Sepsis is a toxic condition caused by the spread of invading organisms, or their by-products, through the bloodstream or in other tissue in the body. It is also known as septicemia. The definition of sepsis

has evolved beyond that of an infection. There is now a spectrum of symptoms of systemic inflammatory response syndrome (SIRS) to septic shock *(Shankar-Hari et al., ٢٠١٦)*. Causes of sepsis include viral, fungal, bacterial or parasitic in nature.

Neonatal sepsis or sepsis neonatarum is an infection that can be attracted in the prenatal period through vertical transmission from the mother bloodstream or during the delivery period from ingestion of infected amniotic fluid. The literature distinguishes two types of neonatal sepsis, early onset and late onset *(Casserly et al., ٢٠١٥)*.

Early-onset sepsis is classified as occurring in newborns less than ٧٢ hours of age. Approximately ١ to ٨ out of every ١٠٠٠ births results in early-onset sepsis. The causes of infection for early-onset sepsis occur from maternal transmission during pregnancy or delivery, or immediately following delivery. Symptoms may be present at birth, but many infants demonstrate symptoms in the first ٢٤ hours of life *(Gu et al., ٢٠١٥)*. Late- onset sepsis is seen in infants after ٧٢ hours of life. The infections causing late-onset sepsis are from a variety of sources, and are usually hospital-acquired infections *(Simpson et al., ٢٠١٦)*.

Nurses are likely to be the first healthcare professionals that families meet, and therefore play a vital role in providing accurate information and managing their concerns and expectations. *(Hayden et al., ٢٠١٦)*.

Nurses are ideally placed to decrease parents' stress and support them during this period of uncertainty, and throughout their child's admission to the hospital **(Al Maghaireh et al., ٢٠١٦).**

A clinical pathway, also known as care pathway, integrated care pathway, critical pathway, or care map, is one of the main tools used to manage the quality in health care concerning the standardization of care processes. It has been shown that their implementation reduces the variability in clinical practice and improves outcomes. Clinical pathways aim to promote organized and efficient patient care based on evidence-based medicine and aim to optimize outcomes in settings such as acute care and home care *(Smith, ٢٠١٧)*.

A clinical pathway(CPs) is a multidisciplinary management tool based on evidence-based practice for a specific group of patients with a predictable clinical course, in which the different tasks (interventions) by the professionals involved in the patient care are defined, optimized and sequenced either by hour (ED), day (acute care) or visit (homecare). Outcomes are tied to specific interventions *(Perer, ٢٠١٥)*.

Purpose:

The purpose of this study was to determine the effect of clinical pathway on nursing care for neonates with sepsis

Research Hypotheses:
- Nursing care of neonates with sepsis significantly will be improved after implementing the clinical pathway intervention.
- Neonates with sepsis who will exposed to the clinical pathway will have negative C reactive protein test , improvement of feeding, and decrease length of hospital stay.

Methods:

Research Design:

A quasi- experimental research design was utilized.

Settings:

The study was carried out at neonatal intensive care units at Benha city they were: Benha Specialized Hospital for Children (affiliated to Ministry of Health) . It included two units. These units are for neonates having different diagnosis. One of them contained ١٤ incubators and the other unit contained ٢٦ incubators. Benha University Hospital. It include two NICUs contains ١٦ incubators and the other unit contained ٨ incubators and Benha Teaching Hospital. It included one NICU composed of ١٥ incubators

Sampling:

It consisted of: A convenient sample consists of ١٤٠ were included and A purposive sample of neonates with sepsis ١٤٠ neonates were included after fulfilling

-Inclusion criteria for neonates:
All neonates should suffer from sepsis

Exclusion criteria:

Neonates with major malformation, congenital heart disease

Instruments:

There were three instruments utilized to collect the required data. Those tools as the following:

Instrument I: A structured interviewing schedule: It was developed by the researchers after reviewing the related literatures and it was written in Arabic language to suit study sample. It contained of four parts

Part (١): Nurses' characteristics such as age, gender qualifications, years of experience, attendance of training courses.

Part (٢): Characteristics of the studied neonates such as gestational age, gender, current age, weight on admission and current weight.

Part (٣): Nurses' knowledge related to sepsis such as definition, causes, clinical manifestations, diagnosis and management of neonates with sepsis. The total questions were ٢٢ and in a form of multiple choice questions.

Part (٤): Nurses` knowledge regarding nursing care of neonates with sepsis, such as; knowledge about maintenance of body temperature, proper fluid management, good nutritional support, circulation, oxygen therapy and suctioning of the neonate with sepsis, care of neonate on ventilator, blood gases estimation, prevention of nosocomial infection, medication administration and prognosis

Scoring system for each item of nurses' knowledge:

- Correct and complete answer was scored (٢)
- Correct and incomplete answer was scored (١)
- Wrong answer or don't know and was scored (٠)

The total score of nurses' knowledge were calculated and classified into three levels as following:
- ↓ ٦٠٪ was considered poor knowledge.
- ↓ ٦٠- ٧٥٪ was considered fair knowledge.
- ٧٥-١٠٠ % was being considered good knowledge.

Instrument II: Clinical pathway for care of neonates with neonatal sepsis checklist:

It was adopted from *(Balamuth et al., ٢٠١١).* It was applied to assess daily nursing care provided to neonates with sepsis inside the incubator. The total practices were ٩ practices.

Scoring system for each item of nurses' practice:

Scoring system for nurses' performances will be as follows:

- Done correctly and competent will score (١)
- Done incorrect or incompetent well will score(٠)

Total score system for nurses' practice will calculated and classified as follow:

- ٦٠ to less than ٧٥ will be considered unsatisfactory.
- ٧٥-١٠٠ % will be considered satisfactory

Instrument III- Neonates' medical outcomes assessment sheet: It was developed by the researchers to assess the improvement of neonates' condition after application of the clinical pathway. It included; negative CRP, feeding improvement and length of hospital stay.

Validity

To measure content validity of the study instrument, the researchers assure that items of the tools were adequately represented by submitting instruments to five experts including; three professors of pediatric nursing from the Faculty of Nursing Cairo, Benha University, and two professors in neonatal medicine from the Faculty of Medicine Benha University, to test the content validity. Modifications of the instruments were done according to the experts' judgment on clarity of sentences, appropriateness of contents and sequence of items.

Pilot Study:

It was conducted on ١٠ % of the total study sample ١٤ nurses to evaluate the feasibility, reliability and clarity of the instruments .It was conducted to test the applicability of the instruments, find out the possible obstacles and problems that might face the researchers and interfere with data collection. Also, time required to fulfill each instrument was estimated (٢٠ minutes) no modifications were required.

Ethical considerations and human rights:

All participants were assured that participation in the study was voluntary; each nurse was informed about the purpose, procedure, benefits and nature of the study and each nurse had the right to withdraw from the study at any time without any rationale, then oral consent obtained from them. Subjects were informed that obtained data will not be included in any further researches. Confidentiality and anonymity of each subject was assured through coding of all data and all information has taken was protected.

Procedure:

١-An official permission for data collection was obtained from the hospitals' managers through submission of official letters issued from the dean of Benha Faculty of Nursing

٢-Data were collected from the beginning of June٢٠١٧ to the beginning of December ٢٠١٧. Immediately after the ethical approval was obtained.

٣-The researchers then started to interview each nurse individually and this took about ١٥-٢٠ minutes for assessing knowledge. Then an evaluation of care provided by nurses was done during their actual work for each neonate (routine care) ٣days / week with follow up of neonates progress condition before and after the clinical pathway. The researchers

were available by rotation ٣ days per week: Sunday in Benha University Hospital, Monday in the Specialized Pediatric Hospital and Tuesday in Teaching Hospital in Benha City.

٤- Determine was done for the area of weakness in nurses knowledge and practice of care in the hospital.

٥-Planning for clinical pathway based on educational program was done.

٦- These studied nurses were divided into ٣٠ groups each group contain ٤-٥ nurse each group receive three sessions for knowledge each session took ١٥-٢٠minus , The total practical sessions composed of ٦ sessions divided on the nurses' groups and related to nurses' actual care of neonates with sepsis. The contents of these sessions include; proper fluid management, oxygen therapy care and ventilation, suctioning of the neonate with sepsis, care of neonate on ventilator and blood gases estimation.

٧- Reassessment for nurses' knowledge and implementation clinical pathway was done using previously mentioned instruments.

٨- An assessment of neonate's outcomes using neonates' medical outcomes assessment sheet

Administrative design:

An official permission for data collection was obtained from the hospitals' managers through submission of official letters issued from the dean of Benha faculty of nursing. The title, objectives and outcomes of the study were illustrated as well as the main data items to be covered, and the study was carried out after gaining the necessary permission.

Statistical design:

The collected data revised, organized, tabulated and analyzed by using SPSS (Statistical Package for the social Science Software) statistical package version ٢٠ on IBM compatible computer. Numerical data (Quantitative data) was presented in tables by using Mean, Standard deviation (X ± SD) and analyzed by applying t-test for normally distributed variables, while qualitative data were expressed as frequency and percentage and chi-square was used. Additionally, other statistical tests such as Independent t test was used as a parametric test of significance for comparison between two samples means. Pearson correlation (r) was used to measure the correlation between quantitative variables.

P-value at .٠٥ was used to determine significance regarding:

- P-value > .٠٥ to be statistically insignificant.
- P-value ≤ ٠٥ to be statistically significant.
- P-value ≤ ٠٠١ to be high statistically significant.

Evaluation Phase:

Upon the completion of the clinical pathway implementation, the posttest evaluation was conducted to evaluate the outcomes by using the same pretest tools.

Results:

Table (١): Shows that, less than half of the studied nurses (٤٦.٥ %) had age between ٢٠< ٢٥ years with mean age of ٢٥.٠٣±٣.٩٢years, with mean years of experience was ٦.٠٥ ± ٢.٣٦years. While, less than two thirds (٦٤.٣٪) of them had diploma of secondary school of nursing. Also, more than half of them (٥٥.٧٪) had attended training programs related to NICU.

Table (٢): Represents that, the vast majority (٩٢.٩٪) of the studied neonates were males. While, the rest of them were females. Also, more than half (٥٨.٦٪) of them had current age in days of ١٠ <٢٠ days.

Table (٣): Illustrates that, distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation. As, there was an improvement in their knowledge in most items on post clinical pathway implementation phase compared with pre-clinical pathway implementation phase knowledge with high statistical significant difference (p <٠.٠٠١).

Table(٤): Views that, distribution of the studied nurses according to their knowledge about infection control in NICU before and after clinical pathway implementation whereas, there was a highly statistical significant difference (p <٠.٠٠١) in the studied nurses' post clinical pathway implementation knowledge scores compared with pre-clinical pathway implementation knowledge scores regarding infection control in NICU.

Table (٥): Views that, Percentage Distribution of the studied nurses according to their Practice about (immediate care) Initiate Pathway for neonatal sepsis before and after clinical pathway implementation whereas, there was a highly statistical significant difference (p <٠.٠٠١) in the studied nurses' post clinical pathway implementation practice scores compared with pre-clinical pathway implementation practice scores regarding their nursing care of neonate with sepsis.

Table (٦): Shows that, distribution of the studied nurses regarding their competent practice scores before and after the clinical pathway implementation. As, there was a statistical significant difference (p

<٠.٠٥) in the studied nurses' post clinical pathway implementation practice scores compared with pre-clinical pathway implementation

Table (٧): Clarifies that, percentage distribution of the studied neonates regarding the effect of clinical pathway on their condition. Whereas, increased positive CRP test of the majority the studied neonates (٨٨.٥٪) before implementation of clinical pathway compared with post clinical pathway. On the other hand, more than half (٥٧.٨٪) of them had length of hospital stay less than ١٠ days after implementation of clinical pathway compared with the pre implementation of pathway.

Table (٨): Reveals that, percentage distribution of total knowledge scores of the studied nurses about sepsis before and after clinical pathway implementation. As, less than two thirds (٦٥.٧٪) of them had poor knowledge pre-clinical pathway compared with more than three quarters (٧٦.٤٪) of them had good knowledge post clinical pathway.

Table (٩): Shows that, percentage distribution of total practice scores of the studied nurses before and after clinical pathway implementation. As, more than two thirds of them (٦٧.١.٢٪) had incompetent practice pre-clinical pathway compared with ٨٠٪ of them had competent practice post clinical pathway implementation**.**

 Table (١٠): Shows that, correlation between studied nurses' knowledge and practices pre and post clinical pathway implementation, it was revealed that there were a highly statistical significance correlation between them pre and post program implementation

Table (١): Percentage distribution of the studied nurses according to their characteristics (no=١٤٠)

Items	No=١٤٠	%
Age < ٢٠ Year ٢٠ – < ٢٥ Year ٢٥ - <٣٠ Year ≥ ٣٠ Year	٥ ٦٥ ٥٠ ٢٠	٣.٥ ٤٦.٥ ٣٥.٧ ١٤.٣
Mean ± St .D ٢٥.٠٣±٣.٩٢		
Gender -male -Female	١٠ ١٣٠	٧.١ ٩٢.٩
Years of Experience < ٣ Years ٣ – < ٦Years ٦ - <٩Years ≥ ٩ Years	٥ ٦٠ ٥٥ ٢٠	٣.٥ ٤٢.٩ ٣٩.٣ ١٤.٣
Mean ±St .D ٦.٠٥ ± ٢.٣٦		
Academic Qualification - Diploma (Secondary School) - Technical Institute of Nursing - Bachelor of Nursing	٩٠ ٤٠ ١٠	٦٤.٣ ٢٨.٥ ٧.٢
Place of work: -Benha University hospital -Benha Teaching Hospital -Benha Children Specialized Hospital	٢٠ ٢٠ ١٠٠	١٤.٣ ١٤.٣ ٧١.٤
Training programs related to NICU -Yes - no	٧٨ ٦٢	٥٥.٧ ٤٤.٣
Total	١٤٠	١٠٠

Table (٢): Percentage distribution of the studied neonates according to their characteristics (no=١٤٠)

Items	No	%
Gestational age		
٢٨ - < ٣٢ week	٨	٥.٧
٣٢ - <٣٦ week	٩٢	٦٥.٧
٣٦ -٤٠ week	٤٠	٢٨.٦
Mean ± ST. D ٣٤.٢ ± ٢.١٦		
Current age		
١- <١٠ days	٢٧	١٩.٣
١٠-<٢٠ day	٨٢	٥٨.٦
٢٠-٣٠ day	٣١	٢٢.١
Mean ± ST. D ١٤.٦ ± ٦.٩		
Weight on admission		
١٥٠٠ - <٢٠٠٠ grams	٦٨	٤٨.٦
٢٠٠٠ - <٢٥٠٠ gram	٤١	٢٩.٣
٢٥٠٠- <٣٠٠٠ grams	٢١	١٥٧.١
٣٠٠٠-٣٥٠٠ gram	١٠	٧.١
Mean ± ST. D ١٢٤٣.٢ ± ٤٨٤.٨		
Current weight		
< ٢٠٠٠ gram	٦٥	٤٦.٥
٢٠٠٠-<٢٥٠٠ gram	٤٤	٣١.٥
٢٥٠٠- <٣٠٠٠ gram	٢٠	١٤.٢
٣٠٠٠- <٣٥٠٠ gram	٩	٦.٤
≥٣٥٠٠ gram	٢	١.٤
Mean ± ST. D ١٤٠٠.٢ ± ٤٩٢.٤		
Sex		
-Male	٧٦	٥٤.٣
- Female	٦٤	٤٥.٧
Type of birth		
-Normal	٦١	٤٣.٦
-Cesarean Section	٧٩	٥٦.٤
Neonates with sepsis which manifested by the criteria		
- Early onset	٥٠	٣٥.٧
- Late onset	٥٠	٣٥.٧
- Nosocomial	٤٠	١٥.٦
Total	١٤٠	١٠٠

١٣

Table (٣): Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=١٤٠).

Nurses' knowledge	Pre-clinical pathway						Post clinical pathway						X^2	P value
	Complete answers		Incomplete answers		Don't know		Complete answers		Incomplete answers		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
-Definition of neonatal sepsis	٦٠	٤٢.٨	٤٠	٢٨.٥	٤٠	٢٨.٥	٧٠	٥٠.٠	٥٠	٣٥.٧	٢٠	١٤.٢	٢٧.١٣	<٠.٠٠١**
-Types of neonatal sepsis	١٠	٧.١	٣٠	٤١.٤	١٠٠	٧١.٤	٨٠	٥٧.١	٣٠	٤١.٤	٣٠	٤١.٤	٣٥.٧١	<٠.٠٠١
- Diagnosis of neonatal sepsis	٣٠	٤١.٤	٩٠	٦٤.٢	٢٠	١٤.٢	٨٠	٥٧.١	٣٠	٤١.٤	٣٠	٤١.٤	٣٥.٧١	<٠.٠٠١
-Treatment of neonatal sepsis	٥٠	٣٥.٧	٦٠	٤٢.٨	٣٠	٤١.٤	٩٠	٦٤.٢	٢٥	١٧.٨	٢٥	١٧.٨	٦٠.٣٥	<٠.٠٠١**
-Complications	٢٠	١٤.٢	٤٠	٢٨.٥	٨٠	٥٧.١	٦٠	٤٢.٨	٥٠	٣٥.٧	٣٠	٤١.٤	١٠.٠٠	<٠.٠٠٠٥**
- Prevention	٣٠	٤١.٤	٩٠	٦٤.٢	٢٠	١٤.٢	١٠٠	٧١.٤	٣٠	٤١.٤	١٠	٧.١	٩٥.٧١	<٠.٠٠١**

Table (٣) continuo: **Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=١٤٠).**

Nurses' knowledge	Pre-clinical pathway						Post clinical pathway						X^2	P value
	Complete answers		Incomplete answers		Don't know		Complete answers		Incomplete answers		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
-Definition of early onset sepsis	١٠	٧.١	٩٠	٦٤.٢	٤٠	٢٨.٥	٦٠	٤٢.٨	٤٠	٢٨.٥	٤٠	٢٨.٥	٥.٧١	<٠.٠٥*
- Signs and symptoms of early onset sepsis	٨٠	٥٧.١	٤٠	٢٨.٥	٢٠	١٤.٢	٩٠	٦٤.٢	٤٠	٢٨.٥	١٠	٧.١	٩٥.٧١	<٠.٠٠١**
- Types of organism caused early onset sepsis	٢٠	١٤.٢	٣٠	٤١.٤	٩٠	٦٤.٢	٥٠	٣٥.٧	٥٠	٣٥.٧	٤٠	٢٨.٥	١.٤٢	>٠.٠٥**
- Risk factors of early onset sepsis	٧٠	٥٠.٠	٤٠	٢٨.٥	٣٠	٤١.٤	١٠٠	٧١.٤	٢٠	١٤.٢	٢٠	١٤.٢	٩١.٤٢	<٠.٠٠١**
- Definition of late onset sepsis	١٠	٧.١	٨٠	٥٧.١	٥٠	٣٥.٧	٦٥	٤٦.٤	٥٥	٣٩.٢	٢٠	١٤.٢	٢٣.٩٢	<٠.٠٠١**
- Signs and symptoms of late onset sepsis	٣٠	٤١.٤	٨٠	٥٧.١	٣٠	٤١.٤	٧٠	٥٠.٠	٤٠	٢٨.٥	٣٠	٤١.٤	١٨.٧٥	<٠.٠٠١**

Table (٣) continuo: **Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=١٤٠).**

Nurses' knowledge	Pre-clinical pathway						Post clinical pathway						X²	P value
	Complete answers		Incomplete Answers		Don't know		Complete answers		Incomplete answers		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
-Definition of nosocomial sepsis	١٧	١٢.١	١٠٩	٧٧.٨	١٤	١٠.٠	١٣٢	٩٤.٢	٥	٣.٥	٣	٢.١	٢٤٣.١٠	<٠.٠٠١**
- Risk factors of nosocomial sepsis	١٩	١٣.٥	١٠٨	٧٧.١	١٣	٩.٢	٣٧	٢٦.٤	٩٨	٧٠.٠	٥	٣.٥	٩٥.٦٧	<٠.٠٠١**
-Types of organism caused nosocomial sepsis	٢٧	١٩.٢	١٠١	٧٢.١	١٢	٨.٥	٨٠	٥٧.١	٥٨	٤١.٤	٢	١.٤	٦٩.٣١	<٠.٠٠١**
-Signs and symptoms of nosocomial sepsis	٥٨	٤١.٤	٧٣	٥٢.١	٩	٦.٤	٣١	٢٢.١	١٠٨	٧٧.١	١	٠.٧	١٣٠.٥٥	<٠.٠٠١**

Table (٤): Percentage distribution of the studied nurses according to their knowledge about infection control in neonatal intensive care unit before and after clinical pathway implementation (no=١٤٠).

Nurses' knowledge	Pre-clinical pathway						Post clinical pathway						X^2	P value
	Complete answers		Incomplete answers		Don't know		Complete answers		Incomplete answers		Don't know			
	No	%	No	%	No	%	No	%	No	%	No	%		
-Sterilization of incubator	٥٨	٤١.٤	٦١	٤٣.٥	٢١	١٥.٠	١٢٦	٩٠.٠	٨	٥.٧	٦	٤.٢	٢٠٢.٣١	<٠.٠٠١ **
- Disinfected of incubator	٨١	٧٥٧.٨	٤٢	٣٠.٠	١٧	١٢.١	١٠٣	٧٣.٥	٢٢	١٥.٧	١٥	١٠.٧	١٠٢.٥٢	<٠.٠٠١ **
- Sterilization of tube of CPAP	٣٥	٢٥.٠	٩٥	٦٧.٨	١٠	٧.١	١٠٥	٧٥.٠	٢٠	١٤.٢	١٥	١٠.٧	١٠٩.٦٤	<٠.٠٠١ **
- Disinfected of neonate umbilical cord	٩٥	٦٧.٨	٢٥	١٧.٨	٢٠	١٤.٢	١٣٠	٩٢.٨	٥	٣.٥	٥	٣.٥	٢٢٣.٢٢	<٠.٠٠١ **
- Disinfected of neonate eyes	١٠٤	٧٤.٢	٢٥	١٧.٨	١١	٧.٨	١١٨	٨٤.٢	٢٠	١٤.٢	٢	١.٤	١٦٧.٠٢	<٠.٠٠١ **
- Change of IV cannula	٥٠	٣٥.٧	٧٣	٥٢.١	١٧	١٢.١	١٠٩	٧٧.٨	٣٠	٢١.٤	١	٠.٧	١٣٣.٩٠	<٠.٠٠١ **

Table (٥): Percentage distribution of the studied nurses according to their practice about (immediate care) initiate pathway for neonatal sepsis before and after clinical pathway implementation (no=١٤٠).

Nurses' knowledge	Pre-clinical pathway				Post clinical pathway				X^2	P value
	Done		Not done		Done		Not done			
	No	%	No	%	No	%	No	%		
-Pathway for neonate : Within first ١٠ minutes	٣٠	٢١.٤	١١٠	٧٨.٥	٨٨	٦٢.٨	٥٢	٣٧.١	٩.٢٥	<٠.٠٥*
-Pathway for neonate : Within first ٢٠ minutes	٤٧	٣٣.٥	٩٣	٦٦.٤	٩٦	٦٨.٥	٤٤	٣١.٤	١٩.٣١	<٠.٠٠١**
-Pathway for neonate : Within first ٤٠ minutes	٥١	٣٦.٤	٨٩	٦٣.٥	٩٩	٧٠.٧	٤١	٢٩.٢	٢٤.٠٢	<٠.٠٠١**
-Pathway for neonate : Within first ٦٠ minutes	٣٣	٢٣.٥	١٠٧	٧٦.٤	١٠٢	٧٢.٨	٣٨	٢٧.١	٢٩.٢٥	<٠.٠٠١**

Table (٦): Distribution of the studied nurses regarding their competent practice scores before and after the clinical pathway implementation (No=١٤٠)

Items	Number of Studied Nurses =(١٤٠) Competent practice					
	Before clinical pathway Done correctly and complete		After clinical pathway Done correctly and complete			
	No	%	No	%	X^2	P value
-Hand washing	٧٢	٥١.٤	١٠٢	٧٢.٨	٢٩.٢٥	<٠.٠٠١*
-Monitoring the vital parameters	١٢٠	٨٥.٧	١٣١	٩٣.٥	١٠٦.٣١	<٠.٠٠١*
-Provide supplemental oxygen and ventilation	٩١	٦٥.٠	١٠٢	٧٢.٨	٢٩.٢٥	<٠.٠٠١*
-Provide good nutritional support with intravenous fluids and electrolytes	٥١	٣٦.٤	٨٨	٦٢.٨	٩.٢٥	<٠.٠٥*
-Suctioning of the neonate either through oral or nasal suctioning	٣٧	٢٦.٤	٩٧	٦٩.٢	٢٠.٨٢	<٠.٠٠١*
-Check regularly blood gases	٢٩	٢٠.٧	١٠١	٧٢.١	٢٧.٤٥	<٠.٠٠١*
- Collection blood sample	٢٤	١٧.١	٩٦	٦٨.٥	١٩.٣١	<٠.٠٠١*
-Prevent nosocomial infection and apply a septic technique	٢٧	١٩.٢	٩٢	٦٥.٧	٥٢.٨٢	<٠.٠٠١*
-Communicate effectively with parents throughout length of hospital stay and at discharge	٥٤	٣٨.٥	١٠٧	٧٦.٤	٣٩.١١	<٠.٠٠١*

Table (٧): Percentage distribution of the studied neonates regarding effect of clinical pathway on their condition (No=١٤٠)

Items	Before application of the clinical pathway		After application of the clinical pathway			
Number of the Studied neonates=(١٤٠)						
	No	**%**	**No**	**%**	**X²**	**P value**
-Feeding improvement					٢٧.٢٥	<٠.٠٠١*
-Normal	٦٠	٤٢.٨	١٠١	٧٢.١		
-Hypoactive/ hyperactive	٨٠	٥٧.١	٣٩	٢٧.٨		
-CRP test					٧١.٤٢	<٠.٠٠١*
-Positive	١٢٤	٨٨.٥	٢٠	١٤.٢		
-Negative	١٦	١١.٤	١٢٠	٨٥.٧		
-Length of hospital stay in days					٥٢.٥٥	<٠.٠٠١*
١٠-	١٠	٧.١	٨١	٥٧.٨		
٢٠-	٥٥	٣٩.٢	٤٨	٣٤.٢		
≥٣٠	٧٥	٥٣.٥	١١	٧.٨		

٢٠

Table ٨:- Percentage distribution of total knowledge scores of the studied nurses about neonatal sepsis before and after clinical pathway implementation (No=١٤٠)

Level of knowledge	Nurses' knowledge before clinical pathway		Nurses' knowledge after clinical pathway		X^2	P value
	No	%	No	%		
-Good (٧٥-١٠٠٪)	١٤	١٠.٠	١٠٧	٧٦.٤		
-Average (٦٠-٧٥٪)	٣٤	٢٤.٢	٢٠	١٤.٢	١١٧.٥٢	<٠.٠٠١
-Poor (<٦٠٪)	٩٢	٦٥.٧	١٣	٩.٢		

Table (٩):Percentage distribution of total practice scores of the studied nurses before and after clinical pathway implementation (No=١٤٠)

Level of performance	Nurses' performance before clinical pathway		Nurses' performance after clinical pathway		X^2	P value
	No	%	No	%		
-Competent (>٧٥٪)	٤٦	٣٢.٨	١١٢	٨٠.٠	٥٠.٤٠	<٠.٠٠١
-Incompetent (<٧٥٪)	٩٤	٦٧.١	٢٨	٢٠.٠		

Table (١٠): Correlation between total knowledge and total practice pre and post clinical pathway implementation (١٤٠)

Items	Pre clinical pathway		Post clinical pathway	
	r	p	r	p
Knowledge	٠.٩٠٢	٠.٠٠٠**	٠.٩٥٢	٠.٠٠٠**
Practice	٠.٨٩١	٠.٠٠٠**	٠.٩١٢	٠.٠٠٠**

Discussion

Sepsis is a widespread bacterial infection in the blood circulation. It is also referred to as septicemia. Infants are at high risk of infection due to their low and immature immune system. The newborn has a poor response to pathogens and the local inflammatory reaction that signals the presence of an infection at the entry site is usually absent, which results in non-specific and broad symptoms **(Robinson et al.,٢٠١٦).**

Clinical pathways have been developed in health care as multidisciplinary care plans that outline the sequence and timing of actions necessary for achievement of expected patient outcomes and organizational goals regarding quality, costs, patient satisfaction and efficiency. Additionally, the concept of clinical pathway refers to specific guidelines for care which describe patient treatment goals and define the sequence and timing of intervention for meeting those goals efficiently. So, the aim of this study was to evaluate the effect of clinical pathway on enhancing nursing care of neonates with sepsis (***Weber et al.,*** ٢٠١٧)**.**

In relation to knowledge of the studied nurses, it is obvious from the current study that, the total knowledge scores post clinical pathway implementation about neonatal sepsis had significant differences towards definition of neonatal sepsis, leading causes, diagnosis, prevention and treatment compared with pre-clinical pathway implementation knowledge scores. This result is supported by **Amin,(٢٠٠٤)** who reported a higher increase in study group subjects' knowledge mean scores immediately post nursing clinical pathway implementation than before, with a highly significant statistical differences. From the researchers' points of view this may due to lack of training courses related to neonatal nursing care.

The current study revealed that, there was a high statistical significant difference (P $<٠,٠٠١$) among nurses competent practices regarding nursing care of neonates with sepsis before and after applying clinical pathway. This is in accordance with **Mahmoud and Abd-El Sadik, (٢٠١٣)** who found that an obvious improvement in practice scores of the study group subjects immediately post nursing clinical pathway implementation than pre-nursing clinical pathway implementation.

Regarding the effect of clinical pathway on the studied neonates. The current study revealed that, there was an obvious improvement of neonates' condition. Whereas, more than half of them had length of hospital stay less than ١٠ days after application of clinical pathway compared with the pre application of pathway. Additionally, the majority of them had negative CRP test after application of clinical pathway compared with the pre application of pathway. This may be due to the effect of newly techniques in application of care especially critically ill neonates. This was in accordance with (**Abdel Sadik and Khalaf,** ٢٠١٦)

who found that, in their study that their findings improving respiratory signs and/or symptoms and decreasing O_2 daily requirements, and these were common criteria for early switch and early signs for neonates' discharge from hospital.

Conclusion:

Based on the findings of this study, we can conclude that:

Implementation of the nursing clinical pathway is highly effective method to improve nurses' knowledge and can enhancing nursing care of neonates with sepsis by raising nurses' knowledge, enhancing their practice, improved neonatal outcomes and reduces their length of hospital stay.

Recommendations:

Based on the results of the current study, the following recommendations were reached:

- Clinical pathway on nursing care of neonates with sepsis should be applied for neonates with sepsis in different settings
- Provision of regular training programs for nurses about care of neonates with sepsis on a wider scale in similar settings to further confirm its utility and benefits in improving nurses' knowledge and practice.

The clinical pathway approach of care can be generalized for utilization by health team members in different pediatric healthcare settings.

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