

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 28 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 140 nurses and a purposive sample of 140 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 72.1 versus 42.8)CRP test positive 14.2 versus 88.5and shortness of length hospitalization ≥ 30 days 7.8 versus 53.5.**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.

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I. 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., 2016). 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., 2015).

Early-onset sepsis is classified as occurring in newborns less than 72 hours of age. Approximately 1 to 8 out of every 1000 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 24 hours of life (Gu et al., 2015). Late-onset sepsis is seen in infants after 72 hours of life. The infections causing late-onset sepsis are from a variety of sources, and are usually hospital-acquired infections (Simpson et al., 2016).

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., 2016).

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., 2016).

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, 2017).

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, 2015).

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 14 incubators and the other unit contained 26 incubators. Benha University Hospital. It include two NICUs contains 16 incubators and the other unit contained 8 incubators and Benha Teaching Hospital. It included one NICU composed of 15 incubators.

Sampling:

It consisted of: A convenient sample consists of 140 were included and a purposive sample of neonates with sepsis 140 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 (1): Nurses' characteristics such as age, gender qualifications, years of experience, attendance of training courses.

Part (2): Characteristics of the studied neonates such as gestational age, gender, current age, weight on admission and current weight.

Part (3): Nurses' knowledge related to sepsis such as definition, causes, clinical manifestations, diagnosis and management of neonates with sepsis. The total questions were 22 and in a form of multiple choice questions.

Part (4): 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 (2)
- Correct and incomplete answer was scored (1)
- Wrong answer or don't know and was scored (0)

The total score of nurses' knowledge were calculated and classified into three levels as following:

- 60% was considered poor knowledge.
- 60- 75% was considered fair knowledge.
- 75-100 % was considered good knowledge.

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

It was adopted from **Balamuth et al., (2011)**. It was applied to assess daily nursing care provided to neonates with sepsis inside the incubator. The total practices were 9 practices.

Scoring system for each item of nurses' practice:

Scoring system for nurses' performances will be as follows:

- Done correctly and competent will score (1)
- Done incorrect or incompetent will score(0)

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

- 60 to less than 75 will be considered unsatisfactory.
- 75-100 % 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 instruments 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 10 % of the total study sample (14 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 (20 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:

- 1-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
- 2-Data were collected from the beginning of June2017 to the beginning of December 2017. Immediately after the ethical approval was obtained.
- 3-The researchers then started to interview each nurse individually and this took about 15-20 minutes for assessing knowledge. Then an evaluation of care provided by nurses was done during their actual work for each neonate (routine care) 3days / week with follow up of neonates progress condition before and after the clinical pathway. The researchers were available by rotation 3 days per week: Sunday in Benha University Hospital, Monday in the Specialized Pediatric Hospital and Tuesday in Teaching Hospital in Benha City.
- 4- Determine was done for the area of weakness in nurses knowledge and practice of care in the hospital.
- 5-Planning for clinical pathway based on educational program was done.
- 6- These studied nurses were divided into 30 groups each group contain 4-5 nurse each group receive three sessions for knowledge each session took 15-20minus,The total practical sessions composed of 6 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.
- 7- Reassessment for nurses' knowledge and implementation clinical pathway was done using previously mentioned instruments.
- 8- 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 20 on IBM compatible computer. Numerical data (Quantitative data) was presented in tables by using Mean, Standard deviation ($X \pm SD$) 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 .05 was used to determine significance regarding:

- P-value $> .05$ to be statistically insignificant.
- P-value $\leq .05$ to be statistically significant.
- P-value $\leq .001$ 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.

II. Results

Results:

Table (1): Shows that, less than half of the studied nurses (46.5 %) had age between 20 < 25 years with mean age of 25.03 ± 3.92 years, with mean years of experience was 6.05 ± 2.36 years. While, less than two thirds (64.3%) of them had diploma of secondary school of nursing. Also, more than half of them (55.7%) had attended training programs related to NICU.

Table (2): Represents that, the vast majority (92.9%) of the studied neonates were males. While, the rest of them, were females. Also, more than half (58.6%) of them had current age in days of 10 < 20 days.

Table (3): 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 ($p < 0.001$).

Table(4): 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 ($p < 0.001$) in the studied nurses' post clinical pathway implementation knowledge scores compared with pre-clinical pathway implementation knowledge scores regarding infection control in NICU.

Table (5): 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 ($p < 0.001$) 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 (6): 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 ($p < 0.05$) in the studied nurses' post clinical pathway implementation practice scores compared with pre-clinical pathway implementation

Table (7): 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 (88.5%) before implementation of clinical pathway compared with post clinical pathway. On the other hand, more than half (57.8%) of them had length of hospital stay less than 10 days after implementation of clinical pathway compared with the pre implementation of pathway.

Table (8): 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 (65.7%) of them had poor knowledge pre-clinical pathway compared with more than three quarters (76.4%) of them had good knowledge post clinical pathway.

Table (9): 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 (67.1.2%) had incompetent practice pre-clinical pathway compared with 80% of them had competent practice post clinical pathway implementation.

Table (10): 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 (1): Percentage distribution of the studied nurses according to their characteristics (no=140)

Items	No=140	%
Age		
< 20 Year	5	3.5
20 - < 25 Year	65	46.5
25 - < 30 Year	50	35.7
≥ 30 Year	20	14.3
Mean ± St .D	25.03±3.92	
Gender		
-male	10	7.1
-Female	130	92.9
Years of Experience		
< 3 Years	5	3.5
3 - < 6 Years	60	42.9
6 - < 9 Years	55	39.3
≥ 9 Years	20	14.3
Mean ±St .D	6.05 ± 2.36	
Academic Qualification		
- Diploma (Secondary School)	90	64.3
- Technical Institute of Nursing	40	28.5
- Bachelor of Nursing	10	7.2
Place of work:		
-Benha University hospital	20	14.3
-Benha Teaching Hospital	20	14.3
-Benha Children Specialized Hospital	100	71.4
Training programs related to NICU		
-Yes	78	55.7
- no	62	44.3
Total	140	100

Table (2): Percentage distribution of the studied neonates according to their characteristics (no=140)

Items	No	%
Gestational age		
28 - < 32 week	8	5.7
32 - < 36 week	92	65.7
36 - 40 week	40	28.6
Mean ± ST. D	34.2 ± 2.16	
Current age		
1- < 10 days	27	19.3
10- < 20 day	82	58.6
20-30 day	31	22.1
Mean ± ST. D	14.6 ± 6.9	
Weight on admission		
1500 - < 2000 grams	68	48.6
2000 - < 2500 gram	41	29.3
2500- < 3000 grams	21	15.7
3000-3500 gram	10	7.1
Mean ± ST. D	1243.2 ± 484.8	
Current weight		
< 2000 gram	65	46.5
2000- < 2500 gram	44	31.5
2500- < 3000 gram	20	14.2
3000- < 3500 gram	9	6.4
≥ 3500 gram	2	1.4
Mean ± ST. D	1400.2 ± 492.4	
Sex		
-Male	76	54.3
- Female	64	45.7
Type of birth		
-Normal	61	43.6
-Cesarean Section	79	56.4
Neonates with sepsis which manifested by the criteria		
- Early onset	50	35.7
- Late onset	50	35.7
- Nosocomial	40	28.6
Total	140	100

Table (3): Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=140).

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	60	42.8	40	28.5	40	28.5	70	50.0	50	35.7	20	14.2	27.13	<-0.001**
-Types of neonatal sepsis	10	7.1	30	41.4	100	71.4	80	57.1	30	41.4	30	41.4	35.71	<-0.001
- Diagnosis of neonatal sepsis	30	41.4	90	64.2	20	14.2	80	57.1	30	41.4	30	41.4	35.71	<-0.001
-Treatment of neonatal sepsis	50	35.7	60	42.8	30	41.4	90	64.2	25	17.8	25	17.8	60.35	<-0.001*
-Complications	20	14.2	40	28.5	80	57.1	60	42.8	50	35.7	30	41.4	10.00	<-0.005*
- Prevention	30	41.4	90	64.2	20	14.2	100	71.4	30	41.4	10	7.1	95.71	<-0.001*

Table (3) continuo: Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=140).

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	10	7.1	90	64.2	40	28.5	60	42.8	40	28.5	40	28.5	5.71	<0.05*
- Signs and symptoms of early onset sepsis	80	57.1	40	28.5	20	14.2	90	64.2	40	28.5	10	7.1	95.71	<0.001**
- Types of organism caused early onset sepsis	20	14.2	30	41.4	90	64.2	50	35.7	50	35.7	40	28.5	1.42	>0.005**
- Risk factors of early onset sepsis	70	50.0	40	28.5	30	41.4	100	71.4	20	14.2	20	14.2	91.42	<0.001**
- Definition of late onset sepsis	10	7.1	80	57.1	50	35.7	65	46.4	55	39.2	20	14.2	23.92	<0.001**
- Signs and symptoms of late onset sepsis	30	41.4	80	57.1	30	41.4	70	50.0	40	28.5	30	41.4	18.75	<0.001**

Table (3) continuo: Percentage distribution of the studied nurses according to their knowledge about neonatal sepsis before and after clinical pathway implementation (no=140).

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 nosocomial sepsis	17	12.1	109	77.8	14	10.0	132	94.2	5	3.5	3	2.1	243.10	<0.001* *
- Risk factors of nosocomial sepsis	19	13.5	108	77.1	13	9.2	37	26.4	98	70.0	5	3.5	95.67	<0.001* *
-Types of organism caused nosocomial sepsis	27	19.2	101	72.1	12	8.5	80	57.1	58	41.4	2	1.4	69.31	<0.001 **
-Signs and symptoms of nosocomial sepsis	58	41.4	73	52.1	9	6.4	31	22.1	108	77.1	1	0.7	130.55	<0.001 **

Table (4): 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=140).

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	58	41.4	61	43.5	21	15.0	126	90.0	8	5.7	6	4.2	202.31	<0.001**
- Disinfected of incubator	81	75.8	42	30.0	17	12.1	103	73.5	22	15.7	15	10.7	102.52	<0.001**
- Sterilization of tube of CPAP	35	25.0	95	67.8	10	7.1	105	75.0	20	14.2	15	10.7	109.64	<0.001**
- Disinfected of neonate umbilical cord	95	67.8	25	17.8	20	14.2	130	92.8	5	3.5	5	3.5	223.22	<0.001**
- Disinfected of neonate eyes	104	74.2	25	17.8	11	7.8	118	84.2	20	14.2	2	1.4	167.02	<0.001**
- Change of IV cannula	50	35.7	73	52.1	17	12.1	109	77.8	30	21.4	1	0.7	133.90	<0.001**

Table (5): 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=140).

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 10 minutes	30	21.4	110	78.5	88	62.8	52	37.1	9.25	<0.05*
-Pathway for neonate : Within first 20 minutes	47	33.5	93	66.4	96	68.5	44	31.4	19.31	<0.001**
-Pathway for neonate : Within first 40 minutes	51	36.4	89	63.5	99	70.7	41	29.2	24.02	<0.001**
-Pathway for neonate : Within first 60 minutes	33	23.5	107	76.4	102	72.8	38	27.1	29.25	<0.001**

Table (6): Distribution of the studied nurses regarding their competent practice scores before and after the clinical pathway implementation (No=140)

Number of Studied Nurses =(140) Competent practice						
Items	Before clinical pathway Done correctly and complete		After clinical pathway Done correctly and complete		X ²	P value
	No	%	No	%		
-Hand washing	72	51.4	102	72.8	29.25	<0.001*
-Monitoring the vital parameters	120	85.7	131	93.5	106.31	<0.001*
-Provide supplemental oxygen and ventilation	91	65.0	102	72.8	29.25	<0.001*
-Provide good nutritional support with intravenous fluids and electrolytes	51	36.4	88	62.8	9.25	<0.05*
-Suctioning of the neonate either through oral or nasal suctioning	37	26.4	97	69.2	20.82	<0.001*
-Check regularly blood gases	29	20.7	101	72.1	27.45	<0.001*
- Collection blood sample	24	17.1	96	68.5	19.31	<0.001*
-Prevent nosocomial infection and apply a septic technique	27	19.2	92	65.7	52.82	<0.001*
-Communicate effectively with parents throughout length of hospital stay and at discharge	54	38.5	107	76.4	39.11	<0.001*

Table (7): Percentage distribution of the studied neonates regarding effect of clinical pathway on their condition (No=140)

Number of the Studied neonates=(140)						
Items	Before application of the clinical pathway		After application of the clinical pathway		X ²	P value
	No	%	No	%		
-Feeding improvement					27.25	<0.001*
-Normal	60	42.8	101	72.1		
-Hypoactive/ hyperactive	80	57.1	39	27.8		
-CRP test					71.42	<0.001*
-Positive	124	88.5	20	14.2		
-Negative	16	11.4	120	85.7		
-Length of hospital stay in days					52.55	<0.001*
10-	10	7.1	81	57.8		
20-	55	39.2	48	34.2		
≥30	75	53.5	11	7.8		

Table 8:- Percentage distribution of total knowledge scores of the studied nurses about neonatal sepsis before and after clinical pathway implementation (No=140)

Level of knowledge	Nurses' knowledge before clinical pathway		Nurses' knowledge after clinical pathway		X ²	P value
	No	%	No	%		
-Good (75-100%)	14	10.0	107	76.4	117.52	<0.001
-Average (60-75%)	34	24.2	20	14.2		
-Poor (<60%)	92	65.7	13	9.2		

(9): Percentage distribution of total practice scores of the studied nurses before and after clinical pathway implementation (No=140)

Level of performance	Nurses' performance before clinical pathway		Nurses' performance after clinical pathway		X ²	P value
	No	%	No	%		
-Competent (>75%)	46	32.8	112	80.0	50.40	<0.001
-Incompetent (<75%)	94	67.1	28	20.0		

Table (10): Correlation between total knowledge and total practice pre and post clinical pathway implementation (140)

Items	Pre-clinical pathway		Post-clinical pathway	
	r	p	r	p
Knowledge	0.902	0.000**	0.952	0.000**
Practice	0.891	0.000**	0.912	0.000**

III. 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., 2016).

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., 2017)

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,(2004)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 <0,001) 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, (2013) 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 10 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, (2016)** who found that, in their study that their findings improving respiratory signs and/or symptoms and decreasing O² daily requirements, and these were common criteria for early switch and early signs for neonates' discharge from hospital.

IV. 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.

V. 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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