

Effect of Clinical Pathway Regarding Promoting Quality Nursing Care of Children with Meningitis Exposed to Invasive Procedures

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Abstract: Acute bacterial meningitis (ABM) is an uncommon but potentially fatal neurologic emergency that requires prompt recognition, diagnostic evaluation, and initiation of parenteral antibiotics. Meningitis results from inflammation of the pia-arachnoid meninges as well as cerebrospinal fluid (CSF). Thus, patients with meningitis often present with signs of meningeal irritation **Overturf, (2005)**. Therefore, **the aim of this study** was to assess the effect of clinical pathway regarding promoting quality nursing care of children with meningitis exposed to invasive procedures through designing, implementing, and evaluating the effect of clinical pathway intervention. **A quasi experimental (intervention)** study design was utilized to achieve the aim of this study. With **a sample** of 42 nurses, regardless of their educational level, years of experience, and attainment of training courses. The study was **conducted** at Benha Fever Hospital and Tookh Fever Hospital in meningitis units. **The tools** of data collection were 1) Interviewing questionnaire was constructed by the researcher, to assess their knowledge about invasive procedures and meningitis 2) Observational checklist to evaluate quality of nursing care during invasive procedures by using a clinical pathway, 3) Behavioral Pain Assessment Scales for Young Children FLACC Scale to assess level and intensity of pain before, during and after invasive procedures, 4) Observational child assessments sheet It was designed to observe children's level of anxiety during and after invasive procedures.. **The results** revealed that, there was that the total means score of nurses' performance regarding invasive procedure pre and post clinical pathway guidelines implementation, had a highly significant difference, and there was no significant correlation between total knowledge and total performance pre the clinical pathway guidelines implementation. While post implementation there was a significant correlation between total knowledge and total performance. It was **concluded** from the study that, implementation of the nursing clinical pathway can improve quality of nursing care of children with meningitis undergoing invasive procedure through improving their knowledge, enhancing their performance regarding invasive procedures, reduces the child's level of anxiety. **The study recommended** that clinical pathway approach of care can be generalized for utilization by health team members in the different health agencies.

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1. Introduction

Meningitis is a term used to describe an inflammation of the membranes that surround the brain or the spinal cord. Meningitis, especially bacterial meningitis, is a potentially life-threatening condition that can rapidly progress to permanent brain damage, neurologic problems, and even death of children (**Rudolf et al., 2011**). The highest incidence of meningitis is between birth and 2 years, with the greatest risk immediately following birth and at 3-8 months of age. Increased exposure to infections and underlying immune system problems present at birth increase an infant's risk of meningitis (**Tunkel et al., 2004**).

The World Health Organization indicates that each year registers nearly half a million new cases suffering from meningitis (**WHO, 2011**). In Egypt, the total cases of meningitis registered in 2011 were for higher than those registered in 2010 (the total number

of cases were 1400 and 1394 respectively) and the number of infected children who are less than fifteen years of meningitis in 2011 is equal to 800 children and this is greater than the number of the infected children in 2010, which is equal to 759. As in the governorate of Qaliubiya, the number of children infected with meningitis in 2011 has reached 48 children (**MOH, 2012**).

The diagnosis of meningitis is determined by performing invasive procedures such as lumbar puncture to obtain cerebrospinal fluid for gram staining and fluid analysis to determine types of pathogens, bacterial infections such as pneumococci, meningococci and viruses (**Dawson, 2010**). Invasive procedure is a diagnostic or therapeutic technique that requires entry of a body cavity or interruption of normal body functions. (**Mosby, 2009**).

Quality has become a major focus within health care, especially in the areas of regulatory quality,

quality assurance, quality improvement and patient safety. As this focus increases, nurses today have many roles; in addition to meeting the needs of patients and serving as part of the health care team, nurses play a key role in meeting quality nursing care to children outcomes and safety, in such areas as medication safety, communication and patient safety. This role allows nurses to contribute to quality improvement (Seigel *et al.*, 2010).

Clinical pathway is a tool or care plans that detail essential steps in patient care with a view to describing the expected progress of the patient. It is also known as critical pathway, integrated care pathway, critical path, care maps and care paths and they are being embraced in many system. Meanwhile, the concept of clinical pathway (Cp) refers to specific guidelines for care that describe patient treatment goals and define a sequence and timing of intervention for meeting those goals efficiently (Every *et al.*, 2000 ; Renholm *et al.*, 2002). The goal of clinical pathway system is to plan for the best care at the lowest cost by increasing collaboration and efficiency among clinical and across disciplines, promoting timeless use of hospital resources, reducing system breakdowns, and focusing the health care teams attention on important aspects of care and the cost (El-Baz, 2008). Meanwhile, clinical pathways were used as a communication tool between professionals to manage and standardize outcome-oriented care.

The most important and significant factor in survival of children with meningitis is the standard of nursing care provided to meet their requirements. Thus, the nurse must possess abroad knowledge for different methods of care for children with meningitis and practical skills in the application of therapies directed toward solving many problems that children exposed to invasive procedures (Thompson *et al.*, 2008)

Nurses have a key role in all aspects of clinical pathway use. Participating in the development of the pathway is the first step, because they begin and end the chain of staff involved in delivering care of children with meningitis. Meanwhile, nurses possess a unique perspective in how health care system works to enhance or impede the delivering of care. Thus, nurses are responsible for initiating the pathway on appropriate patients and ensuring that the various events occur as planned (Coyne *et al.*, 2010).

Significant of the study:

Children suffering from meningitis require special care from nurses to ensure maximum performance. By applying the clinical pathway, it provides opportunities for collaborative practice and team approaches that can maximize the expertise of multi health care team. Meanwhile, clinical pathways provide an appropriate

framework to promote and measure the success of the clinical effectiveness cycle. Therefore, this study will be conducted to assess the effect of clinical pathway on nurses regarding to care of children with meningitis.

Aim of the study:

The aim of this study is to assess the effect of clinical pathway regarding promoting quality nursing care of children with meningitis exposed to invasive procedures through designing, implementing, and evaluating the effect of clinical pathway intervention.

Research Hypothesis:

The quality of nursing care regarding care of children with meningitis exposed to invasive procedures improved after applying the clinical pathway intervention

2. Materials and Methods

Research Design:

Quasi experimental research design will be utilized to achieve the aim of this study.

Setting:

The study was conducted in Benha Fever Hospital and Tookh Fever Hospital in meningitis units

Subjects:

The study subjects consisted of:

1- Nurses subjects:

All available nurses who are working in the previously mentioned settings regardless of their educational level, years of experience, and attainment of training courses (42 nurses).

2- Children subjects:

All available children with meningitis who are hospitalized and exposed to invasive procedurs throughout the period of data collection were included in the study.

Tools of Data Collection:

The following tools were utilized to collect the required data:

I. A Predesigned questionnaire (pre/post test) sheet:

It will be designed by the researcher based up on scientific literature review to collect data about the following:-

1. Characteristics of nurses such as age, qualification, years of experience, training course... etc.
2. Knowledge of nurses regarding to meningitis such as definition, causes, management....etc.
3. Knowledge of nurses regarding to invasive procedures (lumber puncture, intravenous fluids, and blood sampling).

Scoring system:

The scoring system related to these tool covers 4 items:

- 1- Knowledge related to the nature of the disease (meningitis) questions from 1 to 5.
- 2- Knowledge related to lumbar puncture (questions from 1 to 8). Knowledge related to IV fluid, (questions from 1 to 7).
- 3- Knowledge related to blood sampling (questions from 1 to 5).

Each right answer got one score with a total score of 25 for the 25 questions. Those who obtained less than 60% are considered having an unsatisfactory knowledge level and 60% or more are considered satisfactory.

II. An Observational Checklist:

It adopted from **Vicky and Cindy (2011)**; to evaluate quality of nursing care during invasive procedures by using a clinical pathway, which includes:

- Preparatory stage that include care of children before invasive procedures.
- Technique of care during invasive procedures.
- Post procedure care after invasive procedures.
- Pain assessment (before, during and after) invasive procedures.

Scoring system:

It comprised 3 procedures covering the following areas:

1. Lumbar puncture (35 items).
2. IV fluid (14 items).
3. Blood sampling (10 items).

Each item was scored as:

1. Zero → not done.
2. One → incomplete performance.
3. Two → actions that has been done correctly.

The total scores were (59).

Less than 80% are considered unsatisfactory level of performance.

80% or more are considered satisfactory.

III. Behavioral Pain Assessment Scales for Young Children FLACC Scale: Merkel (1997)

To assess level and intensity of pain before, during and after invasive procedures

Scoring system:

According to Behavioral Pain Assessment Scales for Young Children, the total score ranged from 0: 10

- It indicates no degree of pain.
- 1-5 it indicates mild degree of pain.
- 6-9 it indicates moderate degree of pain.
- ≤10 it indicates severe degree of pain

IV. Observational Child Assessments Sheet:

It was designed to observe children's level of anxiety during and after invasive procedures. The tool was adopted from **Abd El -Hamed and Elnail (1991)** to assess the degree of anxiety. It consisted of 36 statements and it was modified by **El Sharkaway et al. (2001)**, to measure the following aspects of anxiety, and then it was modified again by the

researcher to contributing to the age of children included in this study. The tool is composed of two parts:

Part one:

Physiological signs of the child immediately after the procedure of invasive procedures as:

- 1- Heart rate
- 2- Rapid respiration
- 3- Sweating
- 4- Flushed face
- 5- Enuresis

Part two:

Psychological signs of child during the procedure:

- 1- Restlessness
- 2- Stretching muscles
- 3- Striking legs
- 4- Weeping
- 5- Screaming
- 6- Crying
- 7- Biting on lips
- 8- Refuse to obey
- 9- Fear

Scoring system:

The total score of the observational checklist of anxiety for children undergoing invasive procedures ranged from 0-14 distributed as follow:

- 0-4 indicating mild degree of anxiety
- 5- 8 indicating moderate degree of anxiety.
- 9- 14 indicating severe degree of anxiety.

Pilot Study:

The pilot study done on 10% of nurses (four nurses) to test the study tools in terms of clarity, time required. A few items were modified according to nurses' responses in the pilot study. The sample involved in the pilot study was excluded from the study subject.

Validity and Reliability:

The data collection tools were revised by a panel of five experts in the field of pediatric nursing and medicine to test content validity and according to their review; few modifications were carried out in the content.

Procedure:

The current study was carried out on three phases; preparatory phase, implementation phase and evaluation phase.

1) Preparatory phase:

During this phase the researcher performs the following:

- Formulation and revision of all the study tools.
- Formulation of the theoretical and practical part.
- Permissions of data collection and implementation of the study in Benha Fever Hospital and Tookh Fever Hospital in Meningitis Units were obtained from the administrative personnel by a submission

of a formal letter from the Faculty of Nursing, Benha University.

- Official permissions after explanation of the nature and purpose of the study were obtained from the concerning health team member who will be involved in the application of the study.
- As regards to nursing supervisors' roles, they mapped the nursing care plan for all aspects of nursing care. Ensure accurate timing as well as proper nursing clinical performance of child care. Also, they disseminated the information to the involved nursing staff.
- The researcher met nurses three days weekly for three months and focused on completing one day of the pathway at each meeting. All suggested modifications were incorporated into the final draft of the research tools. As a result, the nursing clinical pathway for children with meningitis and undergoing invasive procedures consists of best practice to ensure excellent child outcomes. It covered four main components; 1) a comprehensive aspects of care, 2) timetable 3) multidisciplinary team interventions and 4) expected child outcomes.
- As regards preparation of the instructional management program. The theoretical contents of the program were concerned with disease related facts, as definition of meningitis, determine the possible causes of identify risk factors, recognize signs and symptoms, Invasive procedures and the practical contents of the instructional program.
- Moreover, teaching materials were prepared such as lectures, discussion, and demonstration, re demonstration, handouts, and pictures, real objects that helped in covering theoretical and practical information.

2) Implementation phase:

Data of the current study were collected from November 2012 to April 2013, once an official permission were granted, a total number of 42 nurses who fulfilled the criteria of inclusion were recruited to fulfill the aim of the study.

The researcher approaches the responsible nurses in meningitis units, to identify the number of newly admitted children who have meningitis and undergoing invasive procedures.

Subjects were individually filled out the socio-demographic and pre/ knowledge questionnaire sheet.

The proposed format of nursing clinical pathway was utilized from the time of admission till child discharge. The nurses provided child care according to the predetermined clinical outcomes

The included information and practices were taught to subjects and guided by given instructional program as follows:

Theoretical contents

For theoretical contents, a (4) teaching sessions were conducted, each session took 45 minutes related to meningitis (definition, signs and symptoms, severity, complications and nursing role). The researcher gave each nurse a clinical pathway guidelines related to care of children with meningitis in addition to the teaching sessions to assure understanding and clear any misconception or misunderstanding. The researcher continued to reinforce the gained information, answer any raised questions and gave feedback. Communication channel was kept open between the researcher and the nurses. Then, immediately post knowledge tests were carried out.

For the practical part:

As regards the practical sessions, each nurse were pre tested in performance the pre determined procedures before provision of any information (pre-test) utilizing the observational checklist, in the form of short session of around 30 minutes. 4 sessions for nurses' performance related to all invasive procedure such as lumbar puncture, IV fluid, blood sampling was taught.

3- Evaluation Phase:

Upon the completion of the clinical pathway implementation, the post test to evaluate the outcomes was done using the same pre test tools.

Ethical considerations:

- A permission to carry out the study obtained from the official personnel in Benha fever hospital and Tookh fever hospitals.
- Consent from nurses and each child's mother \ father were obtained after explanation of the aim of the study to them.
- Nurses and each child's mother \ father were informed that participation in the study was voluntary.
- Each one had the right to withdraw from the study at any time.
- The responses of each participant would be held confidential.

Statistical analysis

The collected data were categorized, tabulated, and analyzed using the SPSS computer program Version 15. Numerical data were expressed as mean and standard deviation. Qualitative data were expressed as frequency and percentage. Comparison of means was performed using paired-sample t-test. Correlation among variables was done using Pearson correlation coefficient. Level of significance was set at $p < 0.05$.

4. Results:

The mean age of the studied nurses was 25.46 ± 5.08 years, more than two third (70.4 %) of them were married. As regards nursing qualification, about two third (64.3%) of them had secondary nursing school diploma.

More than half (54.8%) of nurses included in the study had an experiences from two to five years experience, with a mean \pm SD 2.35 ± 0.87 years.

The mean age of the children was 7.73 ± 3.90 years and more than half of them (54.8%) were females.

Table (1): It is clear from this table that total mean score of nurses' knowledge regarding meningitis

pre and post clinical pathway guidelines implementation, had a significant difference about infection transition and severity of disease P – value <0.05 . And highly significant difference about definition and signs and symptoms P value <0.001

Table (1) Mean Score of Nurses' knowledge about meningitis pre and post clinical pathway guidelines implementation

Items Knowledge about meningitis	Pre program	Post program	Period T- test	P value
	Mean \pm SD	Mean \pm SD		
Definition	1.33 \pm 0.47	2.52 \pm 0. 50	10.91	< 0.001
Clinical manifestation	1.76 \pm 0.53	2.66 \pm 0.57	9.50	<0.001
Infection transitions	1.71 \pm 0.45	1.92 \pm 0.40	2.48	<0.05
Severity of the disease	1.47 \pm 0.50	1.69 \pm 0.46	2.46	<0.05

Table (2): It is obvious from this table that the total mean knowledge score pre- nursing clinical pathway guidelines implementation about invasive procedure had no significance toward child condition, child position, bleeding, complication, while showed a high significance toward equipments preparation and infused fluid, hand washing, select a suitable site for needle insertion and cleans the insertion site.

Table (2) Mean Score of Nurses' knowledge about invasive procedure pre and post clinical pathway guidelines implementation (n= 42)

Items related to invasive procedure knowledge	Pre program	Post program	T- test	P value
	Mean \pm SD	Mean \pm SD		
<u>A- lumbar puncture</u>				
1-Definition	1.47 \pm 0.50	2.45 \pm 0.59	7.79	<0.001
2-Purpose	1.30 \pm 0.51	2.59 \pm 0.49	13.10	<0.001
3-Technique	2.57 \pm 0.12	2.00 \pm 0.00	3.27	<0.002
4-Child condition	1.45 \pm 0.37	1.40 \pm 0.29	0.62	>0.05
6-Child position	1.33 \pm 0.47	1.23 \pm 0.43	1.27	>0.05
5-Complication	1.04 \pm 0.21	1.07 \pm 0.26	0.44	>0.05
a- Infection	1.09 \pm 0.53	0.26 \pm 0.44	7.41	<0.001
b- Bleeding	1.30 \pm 0.46	1.57 \pm 0.50	2.55	>0.05
c- Headache	1.02 \pm 0.15	1.26 \pm 0.54	2.67	<0.05
<u>B- IV Fluids</u>				
1-Prepares of equipments and infused fluid.	1.83 \pm 0.37	1.78 \pm 0.41	0.57	>0.05
2- Hand washing	1.80 \pm 0.70	2.07 \pm 0.77	1.63	>0.05
3- Select a suitable site for needle insertion.	1.73 \pm 0.70	1.76 \pm 0.90	0.14	>0.05
4- Cleans the insertion site with alcohol swab.	1.78 \pm 0.92	1.88 \pm 0.94	0.49	>0.05
5- Insert needle catheter and check for blood return.	1.83 \pm 0.53	2.28 \pm 1.08	2.69	<0.05
6- Start to drop by open the clamp according to prescribed flow rate.	1.16 \pm 0.37	1.66 \pm 0.52	4.58	<0.001
<u>C- Blood sample</u>				
Precaution of blood sample	1.35 \pm 0.72	0.52 \pm 0.70	5.77	<0.001

Table (3): cleared that the total mean score of nurses' performance regarding invasive procedure pre and post clinical pathway guidelines implementation, had a highly significant difference (P – values <0.001)

Table (4): revealed that, there was a significant relation between nurses' knowledge and their sociodemographic data (age, nursing qualification and years of experience) P – values of <0.05 , while regarding there marital status and job description no significant relation.

Table (5): cleared that there was no significant relation between nurses' performance and their sociodemographic data.

Table (6): showed a significant difference regarding to pain assessment scale of children before and after invasive procedures.

Table (7): revealed a significant difference regarding to physiological response of children with meningitis during invasive procedures.

Table (8): revealed a significant difference regarding to psychological response of children with meningitis during invasive procedures.

Table (9): showed a significant difference regarding to total mean score of physiological and psychological reaction of the children to invasive procedures.

Table (10): Revealed that regarding the hospital stay of children with meningitis undergoing invasive procedure and exposed to clinical pathway a lesser hospital stay was found, and there was a highly significant statistical difference was found.

Table (11): revealed that there was no significant correlation between total knowledge and total performance pre the clinical pathway guidelines implementation. While post implementation there was a significant correlation between total knowledge and total performance.

Table (3) Mean Score of Nurses' performance during invasive procedure pre and post clinical pathway guidelines implementation (n= 42)

Items	Preprogram	Post program	T- test	P value
	Mean \pm SD	Mean \pm SD		
Prepare equipment	1.00 \pm 0.00	1.80 \pm 0.39	13.20	<0.001
Check equipment	0.80 \pm 0.39	1.54 \pm 0.50	7.14	<0.001
General guideline	1.00 \pm 0.00	1.54 \pm 0.50	7.04	<0.001
Procedure of lumber puncture	1.00 \pm 0.00	1.59 \pm 0.49	7.76	<0.001
infant Procedure	1.00 \pm 0.00	1.76 \pm 0.43	11.45	<0.001
Small child Procedure	1.00 \pm 0.00	1.73 \pm 0.44	10.74	<0.001
Old child Procedure	1.00 \pm 0.00	1.61 \pm 0.49	8.16	<0.001
I.V. fluid Procedure	1.00 \pm 0.00	1.88 \pm 0.32	17.41	<0.001
Blood sample procedure	1.00 \pm 0.00	1.83 \pm 0.37	14.31	<0.001

Table (4) Relation between Nurses' Knowledge and their Socio-demographic data (n=42)

Items	Unsatisfactory		Satisfactory		X ²	P
	N	%	N	%		
Age						
<20	1	50.0	1	50.0	7.74	<0.05
20-<25	10	43.5	13	56.5		
25-<30	7	70.0	3	30.0		
30-<35	7	70.0	0	0.0		
Marital status					0.76	>0.05
Single	5	62.5	3	37.5		
Married	19	57.6	14	42.4		
Divorced	1	100.0	0	0.0		
Nursing qualification:					7.53	<0.05
Diploma	19	70.4	8	29.6		
Diploma of nursing institute	1	20.0	4	80.0		
Diploma of secondary nursing school + pediatrics specially.	5	62.5	3	37.5		
Bachelor of nursing	0	0.0	2	100.0		
Job describes					0.25	>0.05
Nurses	18	62.1	11	37.9		
Supervisor	7	53.8	6	46.2		
Years of experience:					7.74	<0.05
< 2	1	50.0	1	50.0		
2- < 5	10	43.5	13	56.5		
5- <8	7	70.0	3	30.0		
> 8	7	70.0	0	0.0		

Table (5) Relation between Nurses Performance and their Socio-Demographic data (n=42)

Items	Unsatisfactory		Satisfactory		X ²	P
	N	%	N	%		
Age						
• <20	0	0.0	2	100.0	3.44	>0.05
• 20-<25	2	8.7	21	91.3		
• 25-<30	3	30.0	7	70.0		
• 30-<35	2	28.6	5	71.4		
Marital status						
• Single	0	0.0	8	100.0	2.29	>0.05
• Married	7	21.2	26	78.8		
• Divorced	0	0.0	1	100.0		
Nursing qualification:						
• Diploma	6	22.2	21	77.8	2.10	>0.05
• Diploma of nursing institute	0	0.0	5	100.0		
• Diploma of secondary nursing school + pediatrics specially.	1	12.5	7	87.8		
• Bachelor of nursing	0	0.0	2	100.0		
Job describes						
• Nurses	6	20.7	23	79.3	1.09	>0.05
• Supervisor	1	7.7	12	92.3		
Years of experience:						
• < 2	0	0.0	2	100.0	3.44	>0.05
• 2- < 5	2	8.7	21	91.3		
• 5- <8	3	30.0	7	70.0		
• > 8	2	28.6	5	71.4		

Table (6): Distribution of Children in Relation to Pain Scale Before and After Invasive Procedures

Categories	Before		after		X ²	P
	No.	%	No.	%		
<u>Face</u>						
0 No particular expression or smile.	2	4.8	23	54.8	40.751	0.000
1 Occasional or frown, withdrawn, disinterested.	17	40.5	19	45.2		
2 Frequent to constant quivering chin, clenched jaw	23	54.8	0	0.0		
<u>Legs</u>						
0 Normal position or relaxed	0	0.0	0	0.0	38.783	0.000
1 Uneasy, restless, tense	20	47.6	16	38.1		
2 Kicking or legs drawn up	22	52.4	26	61.9		
<u>Activity</u>						
0 Lying quietly, normal position, moves easily	0	0.0	22	52.4	36.372	0.000
1 Squirming, shifting back and forth, tense	23	54.8	18	42.9		
2 Arched, rigid or jerking	19	45.2	2	4.8		
<u>Cry</u>						
0 No cry (awake or asleep)	0	0.0	18	42.9	32.391	0.000
1 Moans or whimpers, occasional complaint	18	42.9	20	47.6		
2 Crying steadily, screams or sobs, frequent complaints	24	57.1	4	9.5		
<u>Consolability</u>						
0 Content, relaxed	0	0.0	21	50.0	40.473	0.000
1 Reassured by occasional touching, hugging or being talking to, distractible	13	31.0	17	40.5		
2 Difficult to console or comfort	29	69.0	4	9.5		

Table (7): Distribution of Children with Meningitis According to their Physiological Response during Invasive Procedures

Items	Before		After		X ²	P
	No.	%	No.	%		
↑H.R						
Yes	0	0.0	42	100.0	84.000	0.000
no	42	0	0	0		
↑ R.R						
Yes	0	0.0	42	100.0	84.000	0.000
no	42	100.0	0	0.0		
Sweating						
Yes	2	4.8	22	52.4	23.333	0.000
No	40	95.2	20	47.6		
Flushed face						
Yes	2	4.8	26	61.9	30.857	0.000
No	40	95.2	16	38.1		
Enuresis						
Yes	4	9.5	42	100.0	4.200	0.040
no	38	90.5	0	0		

Table (8): Distribution of Children with Meningitis According to their Psychological Response during Invasive Procedures

Items	Pre				Post				X ²	P
	No. yes	%	No. no	%	No. yes	%	No. no.	%		
Restless	1	2.4	41	97.6	0	0.0	42	100.0	80.093	0.000
Stretching muscles	1	2.4	41	97.6	34	81.0	8	19.0	53.339	0.000
Crying	2	4.8	40	95.2	24	57.1	18	42.9	26.960	0.000
Striking legs	0	0	42	100.0	28	66.7	14	33.3	42.000	0.000
Weeping	3	7.1	39	92.9	26	61.9	16	38.1	27.860	0.000
Screaming	1	2.4	41	97.6	32	76.2	10	23.8	47.964	0.000
Bit on lips	3	7.1	39	92.9	42	100.0	0	0.0	72.800	0.000
Fear	2	4.8	40	95.2	42	100.0	0	0.0	76.364	0.000

Table (9): Total Mean Score Level of Physiological and Psychological Reaction to Invasive Procedures

Items	pre		Post		t	P
	Mean	Std. Deviation	Mean	Std. Deviation		
Physiological	9.0000	±0.44173	5.8571	±0.84309	21.399	0.000
Psychological	5.6905	±1.17884	9.5714	±1.27150	22.871	0.000
Total	24.6905	±1.25888	15.4286	±1.43379	31.459	0.000

Table (10) Hospital Stay \ day Among Children with Meningitis Undergoing Invasive Procedure and Exposed to Clinical Pathway.

Items	No	%	Z-test	P
Hospital stay				
7-10 days	26	61.9	16.7	0.000
11-15 days	11	26.2		
16-20 days	5	11.9		

Table (11): Correlation between Total Knowledge and Total Performance Pre and Post Clinical Pathway Guidelines Implementation.

Variable	Pre implementation		Post implementation	
	r	P	r	P
Total knowledge & Total practice	0.06	>0.05	0.36	<0.05

4. Discussion

Concerning nurse's knowledge regarding meningitis the current study revealed in table 1, that total mean score of nurses' knowledge pre and post clinical pathway guidelines implementation, had a significant difference about infection transition and severity of disease ($P < 0.05$) and highly significant difference about definition and signs and symptoms ($P < 0.001$). This is results was supported by **Attia, (2008)** who found in her study that nurse's knowledge regarding to thalassemia, is poor knowledge. This might be due to lack of continuous education for these nurses, in addition to lack of their motivation to updating their knowledge. As mentioned by **Khalifa (1992)**, knowledge deficit is the main cause of lack of awareness about the nature of the disease, its cause and importance of treatment.

In this regard, **Attia (2003)** in a study about clinical pathways for orientation of critical care nurses in Baghdad at Ibn El Nafiss cardiovascular teaching hospital's conference room and its coronary care units and El Shaheed Adnan hospital critical care units on 20 study subjects, reported an improvement in nurses' knowledge scores after implementation of the clinical pathway compared to their pre-implementation with a highly significant statistical difference. So the clinical pathway can be used to ensure the consistency of the education provided by all trainers.

It is obvious from table (2) that the total mean knowledge score pre- nursing clinical pathway guidelines implementation about invasive procedure had no significance toward child condition, child position,, bleeding, complication of meningitis, while it showed a highly significant differences toward equipments preparation and infused fluid, hand washing, select a suitable site for needle insertion and cleans the insertion site. This result is supported by **Refai, (2010)** 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. This may be attributed to their families' readiness and being anxious to learn, as well, to the execution of the predetermined teaching plan. Additionally, Through the use of the nursing clinical pathway, the nurse is able to identify those educational areas that must be focused on during the educational process to ensure that patients are prepared to be discharged and care for themselves at home.

The benefits of clinical pathways are that they provide a measurable system of integrated management and enable patients to be involved in their own care (**Cristopher, et al., 2009**). The present study revealed in table (3) that the mean score of nurses' performance regarding to invasive procedure pre and post clinical pathway guidelines implementation, had a highly significant difference ($P < 0.001$). This in accordance with **Refai (2010)** who found an obvious improvement in practice scores of the study group subjects immediately post nursing clinical pathway implementation than pre-nursing clinical pathway implementation. **Patrick (2006)** found that clinical pathways embody practice guidelines, while at the same time allowing variations in the activity of the provider and in patient response.

As found by **Abd El -Hamed and Elnail (1991)** and **El Sharkaway et al. (2001)**, there was a significant relation between nurses' knowledge and their socio-demographic data regarding to age, nursing qualification and years of experience ($P < 0.05$). On the other hand **Abo- Alizm (2003)** found in his study no significant correlation between age and their knowledge scores. Meanwhile, **Abd Alla (2000)** reported that the highest level of knowledge and performance was found between the nurses with less than 5 years of experience.

Regarding to the relation between nurses' performance and their socio-demographic data, the current study showed in table (5) that there was no significant differences. These findings in agree with **Abo-Alizm (2003)** who revealed in his study that there is no significant statistical relationships between the gender, occupation and experiences. These results go in line with **Havva & Hatice (2006)**, whose study findings showed no significant relation between gender, occupation and practice for training activities. While disagree with **Refai (2010)** who reported in her study that a university education obtained a high mean scores in different assessment periods as compared to pre nursing clinical pathway implementation.

As regards children response to pain during invasive procedures, the current study revealed in table (6) a significant difference regarding to pain assessment scale of children before and after implementing the clinical pathway plan. These results supported by **Nassar (2012)** who found in her study that behavioral pain assessment scales for young children had a statistically significant difference

between study and control group in relation to pain assessment before instruction program.

Regarding to physiological response of children with meningitis during invasive procedures before and after clinical pathway implementation, the present study indicated that there was a statistically significant difference as showed in table (7). These result agreed with **Goldenberg, (2003) and Katz, (2003)** who reported that therapeutic preparation of children before exposure to invasive nursing procedures had a positive impact on children physiological responses as well as psychological responses. **Nassar (2012)** also, indicated that there was a statistically significant difference between both groups' children of the studied and controlled groups as their responses were manifested by increased the heart rate, increased respiratory rate, sweating, flushed face, increased temperature and enuresis. Meanwhile, the most easily observable physiological response to fear and anxiety in an individual is the circulatory change that is the action of the heart is strengthened and accelerated. There may be pallor of the stain or flushing of the face.

Regarding to psychological response of children with meningitis during invasive procedures, the present study reported that there was a statistically significant difference as showed in table (8) before and after clinical pathway implementation. These finding supported with **Nassar (2012)** who revealed in her study that the psychological signs of children during vein-puncture was statistically significant differences between both groups of children in the study and control responses as manifested by restlessness, weeping, stretching muscles, as the studied group showed less fear, screaming, while the control group showed more screaming and fear. The finding leads to that preparation of children before venipuncture procedure could reduce the stress and fear.

Regarding the hospital stay of children with meningitis undergoing invasive procedure after clinical pathway implementation, the finding of the current study showed (table 10) lesser hospital stay, there was a highly significant statistical difference pre and post clinical pathway implementation. This could be attributed to nurses' work within teamwork approach that might decrease complications of invasive procedures. These findings agree with **Refai (2010)** who found in her study shorter hospital stay period among the study group as compared to the control group. As reported by **Patrick (2006)** who stated that, reduction in hospital length of stay has been one of the driving forces behind the creation of clinical pathways. Meanwhile, as illustrated by **Falconer et al. (1993)** clinical pathways appeared to be effective in reducing hospital stay and costs.

Furthermore, pathways for invasive procedures showed a stronger hospital stay reduction by comparing the magnitudes of effect.

Regarding correlation between total knowledge and performance pre the clinical pathway guidelines implementation the result of the current study revealed that (table 11) there was no significant correlation. While post implementation there was a significant correlation between total knowledge and total performance. **Attia (2003) and El-Hadary (2009)** reported that the study group subjects who were exposed to nursing clinical pathway showed a higher total and subtotal post mean scores of practice throughout the study periods as compared to the control group subjects, with a highly significant statistical difference. On the same line **Jacavone et al. (2004)** found that the use of a critical pathway with cardiac surgery patients undergoing coronary artery bypass grafting leading to changes in practice with use of the pathway included earlier extubation and earlier patient ambulation.

Conclusion

Based on the result findings, we can conclude that:

Implementation of the nursing clinical pathway can improve quality of nursing care of children with meningitis undergoing invasive procedure through improving their knowledge, enhancing their performance regarding invasive procedures, reduces the child's level of anxiety and the complications as well as reduces length of hospital stay.

Recommendations

Based on the current study findings the following recommendations are suggested:

- Regular training sessions for all nurses to encourage them to perform disease monitoring and related invasive procedures to improve their performance.
- Provision of instructional booklet to nurses attached to the meningitis units and children and their family members admitted to increase health awareness and to improve their level of knowledge.
- Workshops and seminars should be organized to raise awareness of health team personnel and hospital administrators about benefits of clinical pathways for their profession, and debate on replacing traditional nursing practices with collaborative ones to improve quality of care provided and increase patients and their family satisfaction toward hospital services.
- The clinical pathway approach of care can be generalized for utilization by health team members in the different health agencies.

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