

Assessment of Nurses' Competency Level Regarding the Care of Infants with Congenital Anomalies of Central Nervous System

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Abstract

Introduction: Congenital anomalies (CA) of the Central Nervous System (CNS) are birth defects of the physical structure of the brain or spinal cord that occur during fetal intrauterine growth, some are caused by genetic factors and other by environmental factors. **This study aimed to:** Assess the nurses' competency level regarding the care of infants with congenital anomalies of central nervous system. **Design:** A descriptive study was used to conduct this study. **Setting:** This study was conducted at Neurosurgery Department at Mansoura University Hospital. **Subjects:** A purposive sample composed of all available nurses (55 nurses) which are working in the previously mentioned setting. **Tools for data collection:** First tool: Pre-designed questionnaire sheet to assess nurses' knowledge about CA of CNS. Second tool: Competency Checklist to assess nurses' practice regarding the care of infants with CA of CNS. Third tool: Modified Likert scale to assess nurses' attitude toward infants with CA of CNS. **Results:** More than three quarters of the studied sample were females, and about two third of them had less than 5 years in experience. In addition, slightly more than half of them had good total knowledge, slightly more than half of them had incompetent total practice and slightly less than two thirds of them had positive attitude toward infants with CA of CNS. Also, there was statistically significant difference between the studied nurses' total level of practice and their age, educational level and years of experience. **Conclusion:** There was positive correlation between practices of the studied nurses and their total level of knowledge about CA of CNS. Also, it was concluded that nurses' knowledge, practices and attitude affected on nurses' competency level, in addition to that, sex of the studied nurses, their age, educational level and years of experience were considered as factors affecting their competency level in caring of infants with CA of CNS. **Recommendations:** Developing a simplified and comprehensive protocol including policy and procedure about care of infants with CA of CNS to be distributed for nurses in neurosurgery departments.

Keywords: Congenital Anomalies, Central Nervous System, Nurses Knowledge and Practice.

Introduction

Congenital anomalies (CA) are the leading causes of infant morbidity and mortality. Congenital anomalies of the Central Nervous System (CNS) are birth defects of the physical structure of the brain or spinal cord that occur during fetal intrauterine growth. They are a group of serious birth defects associated with high rates of infant death or disability (WHO 2016).

Based on the World Health Organization (WHO) report (2016), about 3 million fetuses and infants are born each year with major CA. They are

found in approximately 3% of newborns. Worldwide surveys have shown that birth prevalence of congenital anomalies varies greatly from country to country. It is reported to be as low as 1.07% in Japan and as high as 4.3% in Taiwan. The variation in rates may be explained by social, racial, ecological, and economical influences. The most common serious congenital disorders are congenital heart defects, neural tube defects and Down syndrome (Onkar, et al., 2014; WHO, 2016).

The etiology of fetal central nervous system anomalies is highly heterogeneous, genetic

conditions are recognized as a major cause. The significance of genetic mutations is also underscored by the fact that many environmental factors lead to CNS malformations through their mutagenic effects. Meanwhile, CNS malformations were strongly associated with chromosomal abnormalities, especially trisomy 13 and 18 (Jack, 2017).

The most common types of CNS anomalies are hydrocephalus, spina bifida and encephalocele. Hydrocephalus is a condition in which there is an accumulation of cerebrospinal fluid (CSF) within the brain. While, spina bifida is a birth defect where there is incomplete closing of the backbone and membranes around the spinal cord (Kahle, et al., 2016; Ferri, 2016).

While encephalocele, is a neural tube defect characterized by sac-like protrusions of the brain and the membranes that cover it through openings in the skull. These defects are caused by failure of the neural tube to close completely during fetal development (Wang, et al., 2015).

Competency refers to specific capabilities, which are made up of knowledge, attitude and skills. Meanwhile, it was understood as, the attainment of knowledge, intellectual capacities, practice skills, integrity and professional and ethical values required for safe, accountable and effective practice as a registered nurse. Nurses caring for infants had congenital anomalies of CNS require professional nursing skills and practices, due to its specificity and complexity, in order to prevent post-operative complication and decrease mortality rate (Butler, et al., 2011).

Significance of Study

The numbers of infants with congenital anomalies of CNS including Hydrocephalus, Spina bifida and Encephalocele constitutes about 480 cases, which admitted yearly at Neurosurgery Department in Mansoura University Hospital (Mansoura University Hospital medical records 2016). Those infants need competent nursing care, so it was needed to assess the competency level for nursing staff, who

deal with infants had CNS anomalies at Mansoura University Hospital.

Aim of The Study

This study aimed to:

Assess the nurses' competency level regarding to care of infants with congenital anomalies of central nervous system.

Research questions:

The current study will answer the following questions:

Are nurses' knowledge, practices and attitude about caring of infants with congenital anomalies of CNS affecting their competency level?

Is there a relation between nurses' characteristics and their competency level in caring of infants with congenital anomalies of CNS?

Subject and Methods

This study was aimed to assess the nurses' competency level regarding the care of infants with congenital anomalies of central nervous system.

Technical Design

A descriptive design was used to conduct this study.

Settings:

This study was conducted at Neurosurgery Department affiliated to Mansoura University Hospitals.

Subjects:

A purposive sample composed of all available nurses (55 nurses) who are working at the previously mentioned setting during the period of data collection regardless their age, sex or years of experience.

Inclusion criteria:

Both sex.

Nurses who care for infants with congenital anomalies of CNS.

Tools for Data Collection

Data collected through the following tools:

Tool 1:

Pre-designed questionnaire sheet:

It was designed by the researcher after reviewing the relevant literature, adapted from **Lima & Bernardino (2014)**. It was written in a simple Arabic language to assess the following:

Part I:

- Characteristics data of the studied nurses including: age, sex, level of education, years of experiences and training courses.
- Characteristics of the infants as age, sex, history of disease, diagnosis, previous hospitalization and intervention.

Part II

Nurses' knowledge about CNS anomalies including: Definition of CA of CNS, predisposing factors, causes, types, signs & symptoms, complications, nursing management, preventive measure and prognosis of the disease.

Scoring system of knowledge:

The right answer was scored one mark, and that wrong was scored zero. These scores were summed-up and converted into a percent score and accordingly was categorized into two levels:

- Above 60%: considered Good level of knowledge.
- Less than 60%: considered Poor level of knowledge.

Tool 2:

Competency Checklist: It was adopted from **Newborn Screening Ontario (NSO), (2017)**, to assess the nurse's practices regarding to care of infants who had congenital anomalies of CNS, including nursing assessment, preoperative care and postoperative care, as, explains rationale and guidelines for caring of infants, educates parents about caring procedure and demonstrates knowledge about disease process.

Scoring system of practice:

The step that was done correctly was scored one mark, and the step that is not done or done incorrectly was scored zero. These scores were

summed-up and converted into a percent score and accordingly was categorized into two levels:

- When the score $\geq 85\%$, indicate Competent level of practice.
- When the score $< 85\%$, indicate Incompetent level of practice.

Tool 3:

Modified Likert scale adapted from (**Likert., 1932**) and modified by (**Tylor., 2018**):

This tool was used to assess nurses' attitude regarding the care of infants with congenital anomalies of CNS and their reaction toward infants' prognosis, as asking questions as, To what extent caring for an infant with CA of CNS needs intensive training, To what extent do nurse respect the questions asked by parents and respond to them and To what extent do nurse think that any member of the nursing staff is able to care for infants with CA of CNS..

Scoring system of attitude:

Nurses' responses to their attitude were used three points Liker scale ranging from 1 to 3 as following:

- Agree =3
- Sometimes =2
- Disagree =1

The score of items were summed-up and the total divided by number of the items, giving a mean score of the part. These scores were converted into a percent score was classified as the following:

- Positive attitude: when the score $\geq 75\%$.
- Fair attitude: when the score from 50% to 75%.
- Negative attitude: when the score $< 50\%$.

II- Operational Design

Content validity and reliability:

Content validity was ascertained by a group of experts (3) in pediatric nursing. Their opinions were elicited regarding the format, layout, consistency, accuracy and relevancy of the tools.

The reliability of tools was done to determine the extent to which items were related to each other using cronbachs' alpha coefficient test.

- **Pilot Study:**

The pilot study was conducted on 10% (6 nurses) of the total number of nurses in the Neurosurgery department affiliated to Mansoura University hospitals, in order to test the applicability, clarity and efficiency of the tool as well as time estimated needed answer the data collection tools, and according to the results of the pilot study, the modifications were performed as needed. The pilot participants were not included in the main study sample.

- **Field work:**

The study was carried out over six months started from the beginning of October 2018 to the end of March 2019, the researcher was available in the previously mentioned setting twice weekly, on Wednesday, the day of cases admission and on Sunday, the day of operation from 9.00 am to 1.00 pm. The researcher first met with nursing staff at the previously mentioned setting, also he met the mothers, who have infants with congenital anomalies of central nervous system, explained the purpose of study after introducing himself. The nursing staff and the mothers were assured that information collected would be treated confidentially and it would be used for research purpose only. The tool of knowledge and Likert scale tool were fulfilled by nursing staff within 20 to 25 minutes and the competency checklist tool was fulfilled by the researcher within 15 to 20 minutes, so the study tools takes about 35 to 45 minutes to be fulfilled.

Ethical consideration:

An approval to carry out the study from the ethical committee of Faculty of Nursing, Ain Shams University, also permission was obtained from the medical and nursing directors of the neurosurgery department affiliated to Mansoura University hospitals. Verbal approval was obtained from the nurses caring of infants with CNS anomalies in addition to verbal approval of infants' mothers before inclusion in the study, a clear and simple explanation

of the study aim was given according to their level of education. They secured that all the gathered data was confidential and used for research purpose only. The researcher was assuring maintaining anonymity and confidentiality of nurses' and mothers' data included in the study. All nurses caring for infants with CNS anomalies and the mothers were informed that they are allowed to choose to participate in the study, also they have the right to withdraw from the study at any time.

III-Administration design:

An approval to carry out the study was obtained through an issued letter from the Dean of the faculty of Nursing, Ain Shams University, to Director of the previously mentioned study setting, explaining the aim of the study in order to obtain their permission and cooperation. The researcher then met the hospital director and explained the purpose and the method of the data collection.

IV-Statistical Design:

The collected data from the studies sample was revised, organized, tabulated, and analyzed using the statistical package for social science "SPSS version 23". Data were presented using descriptive statistics in the form of Frequencies, percentages (%), Mean score degree, standard deviation (SD), Pearson correlation (r), Chi square (χ^2), proportion probability of error (p-value) when P-value equal or less than 0.05 indicates a statistical significant result, while P-value more than 0.05 indicates a non-statistical significant result.

Results

Table (1) shows that, 38.2% of the studied nurses were in age 25 – 30 years with Mean \pm SD (1.8 ± 0.37), while 83.6% of them were female, 30.9% of them had bachelor degree in nursing, in addition to 60% of them had < 5 years of experience and they all (100%) didn't attended training courses.

Table (2) shows that there are no statistically significant differences between

characteristics of the studied nurses and their total knowledge about CA of CNS.

Table (3) shows that there are statistically significant differences between characteristics of the studied nurses and their total practice about CA of CNS.

Table (4) shows that there are highly statistically significant differences between the total knowledge of the studied nurses and their total practice regarding the care of infants with CA of CNS.

Figure (1) shows that, 49.5% of the studied nurses had poor total score of knowledge about CA

of CNS, while 50.5% of them had good total score of knowledge about CA of CNS.

Figure (2) shows that, 54.45% of the studied nurses had incompetent total score of practice regarding CA of CNS, while 45.54% of the studied nurses had competent total score of practice regarding CA of CNS.

Figure (3) shows that, 61.2% of the studied nurses had positive attitude regarding caring of infants with CA of CNS, 24.7% had fair attitude, while 14.1% of and their total knowledge about CA of CNS.

Table (1): Distribution of the studied nurses according to their characteristic (no=55)

Characteristics data of the studied nurses	No.	%
Sex		
Male	9	16.4
Female	46	83.6
Age		
Less than 25 years	16	29.1
From 25 to 30 years	21	38.2
From 31 to 35 years	14	25.5
More than 36 years	4	7.3
Mean±SD	27.8±0.37	
Educational level		
Diploma	18	32.7
Diploma + 2 years speciality	2	3.6
Nursing Technician Institute	18	32.7
Bachelor in Nursing	17	30.9
Years of experience		
Less than 5 years	33	60
From 5 to 10 years	3	5.5
From 11 to 15 years	5	9.1
More than 15 years	14	25.5
Mean±SD	7.22±1.31	
Training courses		
Yes	0	0
No	55	100

Figure (1): Distribution of the studied nurses according to their total knowledge about CA of CNS (no=55)

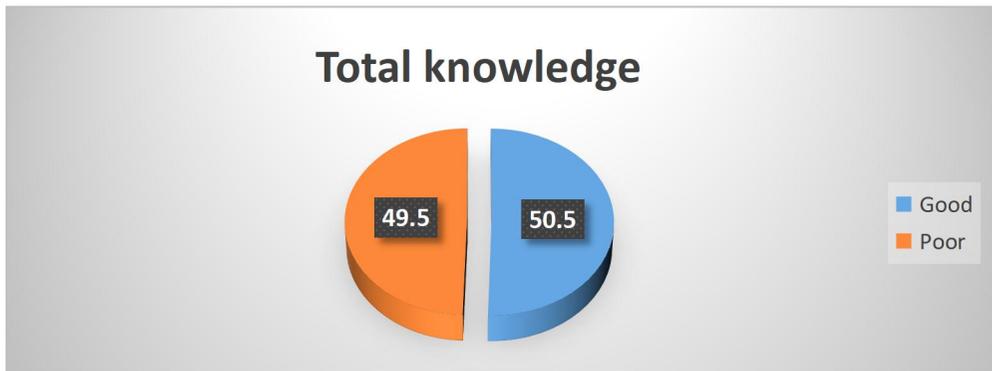


Figure (2): Distribution of the studied nurses according to their total score of Practice regarding CA of CNS (no=55)

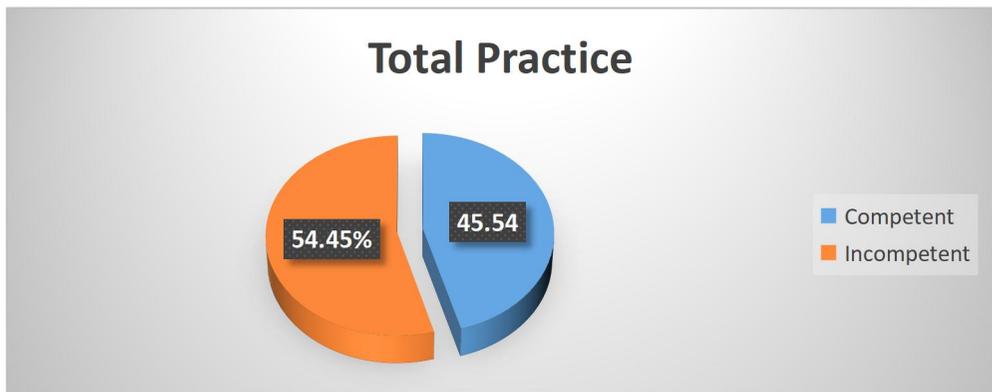


Figure (3): Distribution of the studied nurses according to their total score of attitude toward caring of infants with CA of CNS (no=55)

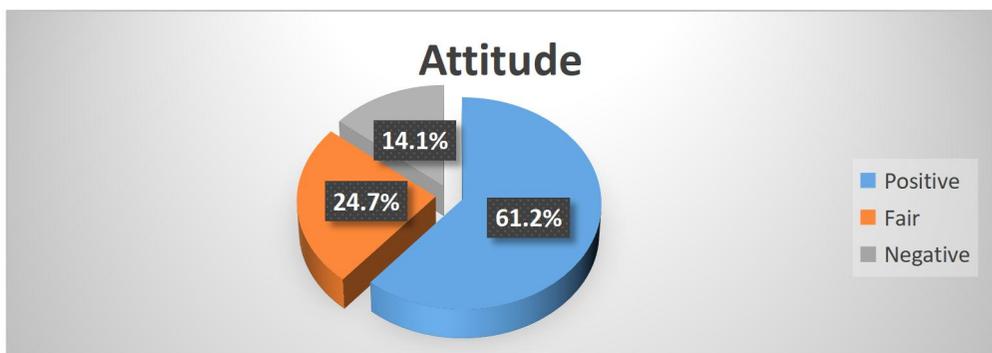


Table (2) Relation between characteristics of the studied nurses and their total knowledge about CA of CNS:

Nurses characteristics	Knowledge				x ²	P value
	Good		Poor			
	No.	%	No.	%		
Age:						
Less than 25 years	8	50	8	50	4.14	0.37
From 25 to 30 years	10	46.7	11	52.3		
From 31 to 35 years	6	42.8	8	57.2		
More than 36 years	2	50	2	50		
Educational level:						
Diploma	8	44.4	10	55.6	3.66	0.41
Diploma+2 years speciality	1	50	1	50		
Nursing Technician Institute	9	50	9	50		
Bachelor in nursing	9	53	8	47		
Years of Experience:						
Less than 5 years	16	48.5	17	51.5	4.15	0.35
From 5 to 10 years	2	66.7	1	33.3		
From 11 to 15 years	2	40	3	60		
More than 15 years	7	50	7	50		

Table (3) Relation between characteristics of the studied nurses and their total practice regarding the care of infants with CA of CNS:

Nurses characteristics	Practice				x ²	P value
	Competent		Incompetent			
	No.	%	No.	%		
Age:						
Less than 25 years	6	37.5	10	62.5	11.42	0.01
From 25 to 30 years	10	47.6	11	52.4		
From 31 to 35 years	5	35.7	9	64.3		
More than 36 years	1	25	3	75		
Educational level:						
Diploma	7	39	11	61	13.86	0.03
Diploma+2 years speciality	1	50	1	50		
Nursing Technician Institute	7	39	11	61		
Bachelor in nursing	9	53	8	47		
Years of Experience:						
Less than 5 years	16	48.4	17	51.6	8.75	0.03
From 5 to 10 years	2	66.7	1	33.3		
From 11 to 15 years	2	40	3	60		
More than 15 years	6	42.8	8	57.2		

Table (4) Correlation between the total knowledge of the studied nurses and their total practice regarding the care of infants with CA of CNS:

Item	Practice	
	r	P value
Knowledge	0.84	0.001**

Discussion

Central nervous system (CNS) malformations represent important factor of morbidity and mortality in children. Congenital abnormalities of the CNS are birth defects of the physical structure of the brain or spinal cord that occur during fetal intrauterine growth. A

wide range of factors can contribute to congenital CNS abnormalities, some are caused by genetic factors. In other cases environmental factors can contribute to the development of a CNS abnormality. Usually, there are problems with brain function or limb movement. Radiological studies to diagnose the specific abnormalities. Treatment (both medical and

surgical, if necessary) is available to help in achieving the best physical and/or mental condition. Unfortunately there are some conditions which cannot be cured **Wolfsdorf, (2019)**.

This study was a descriptive study, aimed to assess the nurses' competency level regarding caring of infants with congenital anomalies of central nervous system.

Regarding to characteristics of the studied sample, the findings of the current study revealed that more than three quarters of the studied sample were females, also more than one thirds of them were at age from 25 to 30 years old, about one third of them studied in Technician Nursing Institute and about two third of them had less than 5 years in experience. These findings were supported by the study of **Aburghif & Atshan, (2016)**, who carried a study about “effectiveness of an educational program on nurse's knowledge toward children with meningitis at pediatric teaching hospitals in Baghdad city”; they found that more than half of both group of the studied sample were females, the majority of them graduated from secondary nursing school and they were at age between 20 to 29 years old. Also, about one thirds of them had 1 to 3 years of experience. On the other hand, this finding not supported by the findings of the study conducted by **Lee & Lee, (2012)** who carried out a study about “preoperative patient teaching: the practice and perceptions among surgical ward nurses”; they found that about three quarters of the studies sample nurses were registered nurses with a bachelor degree in nursing and had more than 10 years of

experience, also about nearly half of them attended training courses. From the researcher's point of view, the majority number of the female in the study sample may be due to the old belief that nursing is a profession for female, so the majority of nurses in Egypt are females.

Regarding to characteristics of the studied infants, the findings of the current study revealed that half of infants were male, one sixth of them were less than one month in age and about half of them were from 1 to 6 months in age. This study were supported by **Floreine, et al., (2017)** who conducted study to determine “factors associated with postoperative complications in hydrocephalic infants diagnosed at Bernard Mevs hospital in Port-au-Prince, Haiti, from 2011 to 2013”; they found that about half of the studied infants were males also, found that about one fifth of them were less than one month in age and about half of them were from 1 to 6 months in age.

Regarding to the knowledge of the studied nurses, this study showed that more than half them had correct knowledge about CNS anomalies, more than one third of them had correct knowledge about neural tube defect and less than two thirds of them had correct knowledge about hydrocephalus, with overall total knowledge score were slightly more than half of them had good total knowledge about caring of infants with CA of CNS. This finding was agreed with a study carried out by **Sacco et al., (2019)** about “a study to assess knowledge and acceptability of foetal surgery for spina bifida amongst healthcare professionals in the UK”; they found that the level of knowledge among healthcare professional was relatively

high. In the researcher point of view, a good level of knowledge is due to the fact that most of the study sample were newly graduated and has a good level of remembering information. On another hand this study was in a disagreement with a study carried out by **Gouda et al., (2019)** about “factors affecting postoperative nursing performance in the surgical units”; they found that more than three quarters of the studied nurses had unsatisfactory total knowledge.

Regarding to the practice of the studied nurses regarding caring of infants with CA of CNS, this study showed that about half of them had competent practice regarding pre and post-operative care of infants with hydrocephalus. This finding was supported by the findings of the study conducted by **Mohamed et al., (2017)** who carried out a study about “the impact of protocol of care for mothers of children with ventriculo-peritoneal shunt on occurrence of postoperative complication”; they found that highest percentage of mothers in the study group had satisfactory level of practices. Contrary, about two thirds of the studied sample had incompetent practice regarding preoperative care of infants with neural tube defect, about one third of them had incompetent practice regarding postoperative care of infants with neural tube defect, and total practice, slightly more than half of them had incompetent total practice. This finding was agreed with a study carried out by **Abd Elaziz et al., (2018)** about “nursing management protocol for mothers of children having ventricular peritoneal shunt”; they found that more than three quarter of the studied mothers had incompetent practice. From the

researcher's point of view, incompetent level of practice of he studied nurses was due to the fact that most of them had less than 5 years of experience, which is considered a very small period for nursing staff, working in a neuro-surgery department and dealing with a patient suffering from CA of CNS.

Regarding to the attitude of the studied nurses regarding caring of infants with CA of CNS, this study showed that slightly less than two thirds of them had positive attitude regarding caring of infants with CA of CNS. This findings was agreed with a study carried out by **Sacco et al., (2019)** about “a study to assess knowledge and acceptability of foetal surgery for spina bifida amongst healthcare professionals in the UK”; they found that the attitude level of healthcare professional was relatively high. On another hand this study was in a disagreement with a study carried out by **Kirabira & Larok, (2012)** about “factors influencing prevention of spina bifida and hydrocephalus in infants; a case of Gulu municipality”; they found that the majority of the studied sample had poor attitude. The researcher point of view agreed with the result of the study carried out by **Baokye et al., (2019)** about “nurses knowledge, attitudes and practices towards patients with HIV and AIDS in Kumasi, Ghana”; which revealed that the majority of the nurses were strongly agreed with the statement ‘patients with HIV/AIDS have the right to the same quality of care as any other patient’.

Regarding the relation between nurses’ characteristics and their total level of practice regarding the care of infant with CA of CNS,

the present study revealed that there were statistically significant differences between the studied nurses' total practice level and their age, education level and years of experience, at $P < 0.05$. These study findings was agreed with a study carried out by **Lee & Lee, (2012)** who carried out a study about "preoperative patient teaching: the practice and perceptions among surgical ward nurses"; they found that statistically significant differences were detected for the following four dimensions: details about the operation, preoperative preparation, operating theatre environment and details about anaesthesia and their importance at $p < 0.001$. From the researcher point of view, a few years of experience of the studies sample and not attending training courses about caring of infants with CA of CNS considered a bad indicator for nurses' practices.

Also, it was observed from the current study that there was positive correlation between practices of the studied nurses and their total level of knowledge about CA of CNS at $P < 0.01$. This finding was agreed with **Mohamed et al., (2017)** who carried out a study about "the impact of protocol of care for mothers of Children with ventriculo-peritoneal shunt on occurrence of postoperative complication"; they found that there was a statistically significant correlation between mothers' knowledge and practice and their level of education. From the researcher point of view, implying that better knowledge about congenital anomalies of CNS has a positive effect on the practice regarding the care of infant with CA of CNS.

Conclusion

Based on the results of the present study, this study concluded that, about half of the studied nurses had poor knowledge about congenital anomalies (CA) of central nervous system (CNS). Also, more than half of them had incompetent practice regarding the care of infants with CA of CNS. As well as, about two thirds of the studied nurses (61.2%) had positive attitude toward caring of infants with CA of CNS. In addition to that, there was no statistically significant difference between the studied nurses' total level of knowledge and their age, educational level and years of experience at $P > 0.05$. As well as, there was statistically significant relation between the studied nurses' total level of practice and their age, educational level and years of experience at $P < 0.05$. In addition, there was no statistically significant relation between the studied nurses' total score of attitude and their age, educational level and years of experience at $P > 0.05$. Also, there was positive correlation between total level of practice and their total level of knowledge about CA of CNS, which means better knowledge has a good effect on practice. But there were negative correlation between their attitudes and both their total knowledge and total practices, this is due to positive attitude inspite of low level of knowledge and practice. Also, it was concluded that nurses' knowledge, practices and attitude affected on nurses' competency level, in addition to that, sex of the studied nurses, their age, educational level and years of experience were considered as factors affecting their competency level in caring of infants with CA of CNS.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Providing health training program at neurosurgery departments about

congenital anomalies (CA) of central nervous system (CNS) to raise awareness of the nurses.

2. Developing a simplified and comprehensive protocol including policy and procedure about care infants with CA of CNS to be distributed for nurses in neurosurgery departments.
3. Further studies should be carried out in other health care facilities to assess nurses' knowledge, practice and attitude regarding CA of CNS.

References

- Abdelaziz, M., Elaal, E., El-Sadik, B. and Said, K. (2017):** Nursing management protocol for mothers of children having ventricular peritoneal shunt, *Egyptian Nursing Journal*, 14. 226. 10.4103/ENJ.ENJ_21_17.
- Aburghif, L. & Atshan, R. (2016):** Effectiveness of an Educational Program on Nurse's Knowledge toward Children with Meningitis at Pediatric Teaching Hospitals in Baghdad City, *International Journal of Scientific and Research Publications*, 6 (9): 346-356.
- Boakye, D. and Mavhandu-Mudzusi, A. (2014):** Nurses knowledge, attitudes and practices towards patients with HIV and AIDS in Kumasi, Ghana, *International Journal of Africa Nursing Sciences*, doi.org/10.1016/j.ijans.2019.05.001
- Butler, M., Cassidy, I., Quillinan, B., Fahy A., Bradshaw, C., Tuohy, D., O'Connor, M., McNamara M., Egan G. and Tierney, C., (2011):** Competency assessment methods - tool and processes: a survey of nurse preceptors in Ireland. *Nurse Education Practice* 11(5), 298- 303.
- Ferri, F., (2016):** Clinical Professor, Department of Community Health, Brown Medical School, Providence, Rhode Island. Ferri's Clinical Advisor 2017: 5 Books in 1. Elsevier Health Sciences. p. 1188.e2. ISBN 9780323448383.
- Floreine, J., Bernard, J. and Augustin, S. (2017):** Factors Associated with Postoperative Complications in Hydrocephalic Infants Diagnosed at Bernard Mevs Hospital in Port-au-Prince, Haiti, from 2011 to 2013. *World Neurosurgery*. 103. 10.1016/j.wneu.2017.04.073.
- Gouda, A., Mohammed, E. and Ameen, D. (2019):** Factors Affecting Postoperative Nursing Performance in The Surgical Units, *Egyptian Journal of Health Care*. 10. 50-64. 10.21608/ejhc.2019.26750. DOI: 10.21608/ejhc.2019.26750
- Jack, (2017):** Director of Critical Care Medicine, Nicklaus Children's Hospital, Clinical Professor of Pediatrics, (1984-2004). Last reviewed 5/2/2017.
- Kahle K., Kulkarni A., Limbrick, D., and Warf, B. (2016):** "Hydrocephalus in children." London, 387 (10020):78899. doi:10.1016/s0140 6736(15)60694-8. PMID 26256071.
- KIRABIRA, P. & LAROK, R. (2012):** Factors influencing prevention of spina bifida and hydrocephalus in infants; International Health Sciences University, 618.928096761 AWI, Retrieved from: <http://hdl.handle.net/123456789/333>.

- Lee, C. & Lee, I. (2012):** Preoperative patient teaching: The practice and perceptions among surgical ward nurses, *Journal of clinical nursing*, 22. 10.1111/j.1365-2702.2012.04345.x.
- Lima K., & Bernardino, E. (2014):** Nursing Care in a Hematopoietic Stem Cells Transplantation Unit, *Text Context Nursing*, Florianópolis, 2014; 23(4): 845-53.
- Mohamed, A., Ahmed, A., Khalafalaah, H., Ali, K. and Mohamed, S. (2017):** The impact of protocol of care for mothers of children with ventriculoperitoneal shunt on occurrence of postoperative complications, *International Journal of Research in Applied, Natural and Social Sciences*, 5 (2): 73-86
- Newborn Screening Ontario (NSO), (2017):** "Suggested Competency checklist, Ontario Newborn Screening for Critical Congenital Heart Disease (CCHD) by Pulse Oximetry." NEWBORN SCREENING ONTARIO, 415 Smyth Road, Ottawa, Ontario, K1H 8M8, Toll-free: 1877-NBS-8330, 2017, www.newborn-screening.on.ca/.
- Onkar D., Onkar P. and Mitra K. (2014):** Evaluation of fetal central nervous system anomalies by ultrasound and its anatomical co-relation. *Journal of Clinical and Diagnostic Research*. 2014;8(6):AC05–AC07. doi: 10.7860/jcdr/2014/8052.4437.
- Sacco, A., Ahmed, S., Deprest, J. and David, A. (2019):** A study to assess knowledge and acceptability of foetal surgery for spina bifida amongst healthcare professionals in the UK, *Journal of Obstetrics and Gynaecology*, DOI:10.1080/01443615.2019.1621820
- Taylor, S. (2018):** "How do *you* pronounce Likert (as in Likert scale)?" Retrieved 28 February 2018
- Terri K., and Susan C., (2013):** *Essential of Pediatric Nursing*, 2nd ed, China, Wolter Kluwer Health, Pp 1219.
- WHO (2016):** World Health Organization. Congenital anomalies. Fact sheet No 370. October 2012 (<http://www.who.int/mediacentre/factsheets/fs370/en>) updated 2016
- Wang, Y., Liu, G., Canfield, M., Mai, C., Gilboa, S., Meyer, R., Anderka, M., Copeland, G., Kucik, J., Nembhard, W. and Kirby, R. (2015):** National Birth Defects Prevention Network. Racial/ethnic differences in survival of United States children with birth defects: A population-based study. *J Pediatr*; 166(4):819-26.e1-2.
- Wolfsdorf, J., Krane, E., Rhodes, E., Claude, R. and Rowe, E. (2019):** *Essentials of Endocrinology*. 10.1016/B978-0-323-42974-0.00027-6.