

Nurses' Performance Regarding Caring of Patient with Diabetic Ketoacidosis

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Abstract

Diabetic ketoacidosis is an acute, major, life-threatening complication of diabetes, may be fatal if not treated quickly and appropriately. Nurses' knowledge and practice play important roles in provision of supportive care to decrease morbidity and mortality secondary to diabetic ketoacidosis. **Aim of the study** to assess nurses' performance regarding caring of patient with diabetic ketoacidosis. **Study design:** a descriptive exploratory design. **Subjects and methods:** Convenience sample of 40 nurses were recruited from Medical Intensive Care Unit at Ain Shams University Hospital within 6 months duration. **Tools:** consisted of (1) Self-administered questionnaire to assess nurses' knowledge regarding caring of patients with diabetic ketoacidosis, (2) Nurses' practice observational checklists to assess nurses' practice regarding caring of patients with diabetic ketoacidosis. **The Results** of this study revealed that, 75% of nurses had unsatisfactory level of knowledge as regards diabetic ketoacidosis and 85% of them had unsatisfactory level of practice. **Conclusion** This study concluded that, the majority of nurses had unsatisfactory level of knowledge and practice regarding caring of patients with diabetic ketoacidosis. It was elicited that there was no statistically relation between overall nurses' knowledge and practice and demographic characteristics, also there was no statistically relation between total nurses' knowledge and practice. **Recommendations:** this study recommended; the importance of conducting In-service training advancing educational program for nurses caring of patients with diabetic ketoacidosis for improving their performance & quality of care provided for such group of patients.

Key words: Diabetic ketoacidosis, Performance.

Introduction

Diabetic ketoacidosis (DKA) is an acute, major, life-threatening metabolic complication of diabetes occurs mostly in type 1DM also it can occur in type II; it is characterized by hyperglycemia, ketonemia, ketonuria and metabolic acidosis (*Kishore, 2016*).

Diabetic ketoacidosis remains a significant source of morbidity among

patients with diabetes. The presence of DKA leads to a new diagnosis of diabetes in up to 20% of patients. Fortunately, mortality attributable to DKA is generally less than 5% with appropriate treatment (*Lanken, Kohl, Hanson & Manaker, 2014*).

Signs and symptoms of DKA vary with severity and comorbid conditions. Polyuria with polydipsia is the most common presenting symptoms weight loss, fatigue, dyspnea; vomiting, abdominal pain and polyphagia.

Dehydration causes tachycardia and orthostatic hypotension. The metabolic acidosis may lead to compensatory deep (Kussmaul) respirations; mental status can vary from somnolence to lethargy and coma. A detailed evaluation may reveal precipitating factors, especially infection and no adherence to medical regimens, which are common causes of DKA (*American Family Physician, 2013*).

Successful treatment of DKA involves identification of the precipitating factors, frequent patient monitoring, along with correcting dehydration, hyperglycemia and electrolyte imbalances. Correction of dehydration is aimed at restoring fluid volume by initial fluid replacement based on vascular status. Administration of regular insulin by IV infusion is the treatment of choice for DKA. Follow-up fluid replacement depends on the state of dehydration, serum electrolyte levels and urine output to prevent hypokalemia (*Sanuth, Bidlencik & Volk, 2014*).

There are many ways to prevent DKA. One of the most important ways is proper management of diabetes to prevent complications. Preventive measures include; keep blood sugar levels within normal range by checking them several times per day, never skipping insulin doses, developing an emergency or "sick-day" plan, testing urine for ketone levels during stress or illness, seeking medical care when blood sugar and ketone levels are higher than normal as early detection is essential (*Wint & Leonard, 2014*).

Once the patient diagnosed with DKA will need both dehydration and hyperglycemia managed. The nurses should assessed airway, give oxygen, determine level of consciousness, assess blood sugar level and watch closely for signs of cerebral edema. Cardiac monitoring is used to assess for evidence

of hyper or hypokalemia. Vital signs should be taken routinely; start intravenous (IV) fluids to restore circulatory volume and correct electrolyte deficits, also arterial blood gases and electrolyte levels are monitored closely. Also nurses must confirm the kidneys are functioning adequately with at least 30 ml of urine output/hour (*Beard, 2014*).

Fluid resuscitation is reserved for patients requiring restoration of circulation. The possibility of over-hydration should be monitored. Nurses should also monitor for complications related to fluid volume excess. Once the blood glucose level decreases to about 250 mg/dl., glucose is added to IV solutions to avoid hypoglycemia and cerebral edema (*Randall, Begovic & Hudson, 2011*).

Significance of the study

Diabetic ketoacidosis (DKA) continues to have high rates of morbidity and mortality despite advances in the treatment of diabetes mellitus. Although the highest rate of mortality is in older adults and persons with comorbid conditions. DKA is the leading cause of death in persons younger than 24 years with diabetes, most often because of cerebral edema (*American Family Physician, 2013*).

Despite advancements in self-care of patients with diabetes, DKA accounts for 14% of all hospital admissions of patients with diabetes and 16% of all diabetes-related fatalities. DKA frequently is observed during the diagnosis of type 1 diabetes and often indicates this diagnosis (*Hamdy, 2016*).

Aim of The Study

This study aims to assess nurses' performance regarding caring of patient

with diabeticketoacidosis through the following:

1-Assess nurses' knowledge regarding caring of patient with diabetic ketoacidosis.

2-Assess nurses' practice regarding caring of patient with diabetic ketoacidosis.

Research Questions

To achieve the aim of this study the following research questions were formulated:

1-What is nurses' knowledge regarding caring of patient with diabetic ketoacidosis?

2- What is nurses' practice regarding caring of patient with diabetic ketoacidosis?

Subjects and methods

Research design

A descriptive exploratory design was utilized to conduct this study.

Research Setting

The study was conducted in Medical Intensive Care Unit (ICU) at Ain Shams University Hospital.

Subjects

Convenience sample of 40 nurses were recruited from the previously mentioned setting for those available nurses from different gender, age and different level of education, caring of patients with diabetic ketoacidosis and agreed to participate in this study

Tools for data collection

Two different tools were used to collect data:

I-Self-administered questionnaire

It was developed by the researcher based on the recent literatures (*Pellico, 2013; Burke et al., 2014; Hinkle & Cheever, 2014 & Urden et al., 2014*). It was used to assess nurses' knowledge regarding caring of patients with diabetic ketoacidosis. The questionnaire was constructed in the form of multiple choice questions (MCQ) and the total number of questions was (35) questions, this questionnaire included two parts divided as follows:-

1st part: It represents demographic characteristics of nurses under study such as (gender, age, level of education and years of experience, as well as attended any training course related to diabetic ketoacidosis).

2nd part: It concerned with the assessment of nurses' knowledge regarding diabetic ketoacidosis. It was consisted of (35) MCQ, which grouped to three subgroup as follows:

(A): It included 11 questions related to nurses' knowledge regarding diabetic ketoacidosis disease.

(B): It included 13 questions concerned with nurses' knowledge toward nursing care of patients with diabetic ketoacidosis.

(C): It included 11 questions related to nurses' knowledge regarding instructions that must be given to patients with diabetic ketoacidosis to be followed after their discharge from the hospital.

Scoring system:

The total score of questionnaire tool was 35 marks (100%). Zero mark was given for each incorrect answer and one mark for each correct answer.

Evaluation was considered as follow:

- Satisfactory score for knowledge $\geq 70\%$ (≥ 24.5 marks).
- Unsatisfactory score for knowledge $< 70\%$ (< 24.5 marks).

II- Nurses' practice observational checklists for caring of patients with diabetic ketoacidosis.

The observational checklists were carried out to assess the level of nurses' practice regarding caring of patients with diabetic ketoacidosis; it was adapted from (*Basavanhappa, 2009; Joint British Diabetes Societies (JBDS), 2013 & Lynn, 2015*) and consisted of (7) main items covering all procedures include:

Nurses' practice during; emergency care (on admission) blood glucose test procedure, urine ketone test strip procedure, intra- venous infusion therapy procedure, intravenous insulin infusion via a volume -control administration set procedure, arterial blood gases (ABGs) procedure and Nurses' practice after care of patients with DKA.

Scoring system as the following:

The total score of checklists 163 marks (100%). Each step in the observational checklists was checked as done and not done. The responses were scored one mark for done step and zero for not done one.

Evaluation was considered as follows:-

A subject with satisfactory score of practice $\geq 70\%$ (≥ 114.1 marks).

While unsatisfactory score of practice $< 70\%$ (< 114.1 marks).

The preparatory phase:

It included extensive reviewing of the current, past and relevant related literature and theoretical knowledge of the various related aspects using books, articles, internet, periodical magazines, scientific journals and more recent national and international literature reviews concerning nurses' performance regarding caring of patients with diabetic ketoacidosis of the various aspects of this issue in order to develop the data collection tools

Pilot study

The pilot study was carried out on 10% of the nurses under the study (6 nurses) to test applicability of the developed tools, the clarity of the included questions as well as estimate the average time consuming needed to complete all questions, the results obtained were studied and analyzed. Nurses who shared in pilot study were excluded from the study sample.

Field work

Interviewing with 40 nurses caring of patients with diabetic ketoacidosis in the previously mentioned setting, the researcher introduced herself, the aim of the study and component of tools were explained at the beginning of data collection. The researcher assured that the data collected would be treat confidentially and used only for the purpose of the research, the researcher took their approval (oral consent) to

participate in the study prior to any data collection.

Data were collected in 6 months, from beginning of December 2015 to the end of May 2016; the researcher visited the Medical ICU at the research setting four days weekly (Saturday, Sunday, Monday and Tuesday) during morning shift from 9:00 am to 2:00 pm in the previously mentioned setting.

First; the researcher used the observational checklists prior to administering of questionnaire to ensure the maximal realistic observation of the nurses practice and minimize the possibility of bias, nurses' practice were assessed by the researcher while they were caring of patients with diabetic ketoacidosis. Each nurse was observed by the researcher during practice of any nursing procedure, it took about 35-45 minutes for every nurse personal to full-filled by the researcher.

Second; then self-administered questionnaire was distributed and full-filled by the nurses caring of patients with diabetic ketoacidosis, it took about 20-30 minutes to be full-filled by the nurse; the answers were recorded by the nurses themselves. Only code numbers were used and no names appeared. Also the data was collected by the researcher using simplified Arabic language.

Administrative design:

An approval official letter obtained from Faculty of Nursing, Ain Shams

University was sent to the manager of Ain Shams University hospital explaining the aim of the study to obtain permission for the data collection. An oral consent was taken from nurses to participate in research process.

Ethical consideration:

The ethical considerations of the study included the following:

The research approval obtained before starting the study. Explaining the aim of the study to the director to take his permission to do the study. Nurses were informed that they are allowed to choose whether to participate or withdraw from the study at any time.

Statistical Design:

All data were collected, entry, organized, categorized and analyzed through computer using the statistical package for social science (SPSS) version tabulated and subjected to statistical analysis, also (p- value) test were also used to test of significance (the relation between qualitative variable) and regarding significance of result, the observed difference and associations were considered as follows:

$p > 0.05$ not significant (NS)

$p < 0.05$ significant (S)

$p < 0.01$ highly significant (S)

Results

Table (1): Number and percentage distribution of demographic characteristics of the nurses (n=40)

Demographic characteristics	No	%
Gender		
Male	6	15%
Female	34	85%
Age		
<30	16	40 %
30 – 40	13	32.5%
40+	11	27.5%
Mean 32.5SD± 7.1		
Level of Education		
Diploma nursing	29	72.5%
Technical institute.	7	17.5%
Bachelor degree	4	10 %
Years of Experience		
< 10	15	37.5%
10 – 15	10	25 %
15 +	15	37.5%
Mean 11.9SD± 6.9		
Training course regarding diabetic ketoacidosis		
Yes	10	25 %
No	30	75 %

As regards demographic characteristics of the nurses; Table 1 illustrates that 85% of nurses were female, 40 % of them their ages less than 30 years old, 72.5% of them had diploma nursing, 25% of them had experience 10-15 years and 75% of them didn't have training course regarding diabetic ketoacidosis.

Part II: Nurses' level of knowledge regarding diabetic ketoacidosis:

Figure (1): Total nurses' knowledge regarding diabetic ketoacidosis. (n=40)

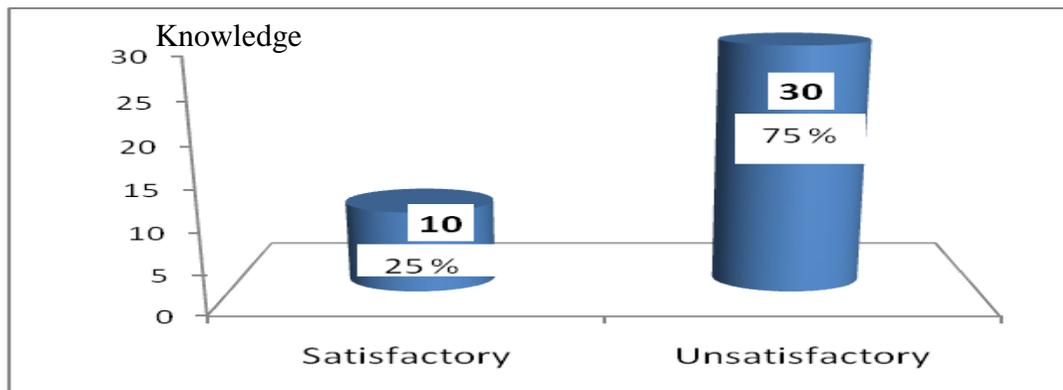


Figure 1: shows that 75% of the nurses had unsatisfactory level of knowledge regarding caring of patients with DKA.

Table (2): Nurse's knowledge regarding caring of patient with diabetic ketoacidosis.

Knowledge (items)	Satisfactory		Unsatisfactory	
	No	%	No	%
1-Nurses' knowledge regarding diabetic ketoacidosis disease	11	27.5%	29	72.5%
2-Nurses' knowledge regarding nursing care of patients with diabetic ketoacidosis	7	17.5%	33	82.5%
3-Nurses' knowledge regarding instructions that must be given to patients with diabetic ketoacidosis to be followed after their discharge from hospital	25	62.5%	15	37.5%

Table 2 Show that nurses had unsatisfactory level of knowledge regarding diabetic ketoacidosis disease and nursing care of patients with diabetic ketoacidosis (72.5% and 82.5%) respectively. Whereas 62.5% of them had satisfactory level of knowledge regarding instructions that must be given to patients with diabetic ketoacidosis to be followed after their discharge from hospital.

Part III: Nurses' level of practice regarding caring of patients with diabetic ketoacidosis:

Figure (2):Total nurses' practice toward caring of patients with diabetic ketoacidosis

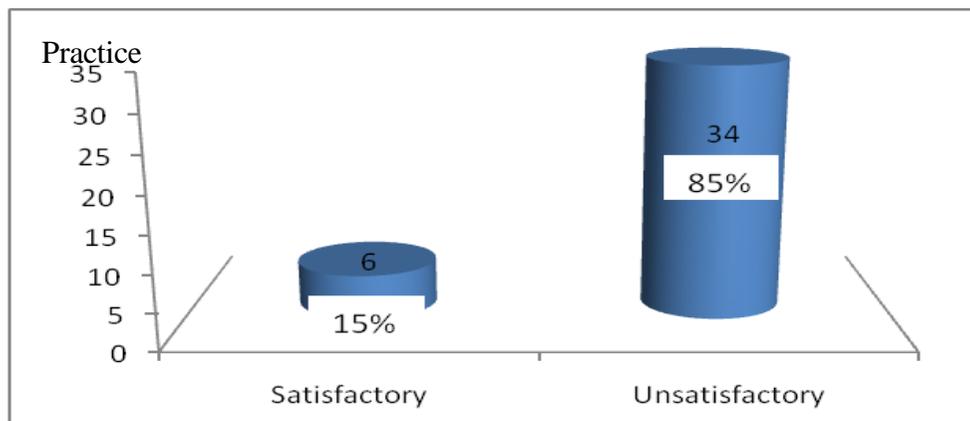


Figure 2: shows that 85% of nurses had unsatisfactory level of practice toward caring of patients with DKA.

Table (3):Total nurses' practice regarding caring of patients with diabetic ketoacidosis

Practice	Satisfactory		Unsatisfactory	
	No	%	No	%
1- Nurse's level of practice during emergency care (on admission)	13	32.5%	27	67.5%
2- Nurse's level of practice during blood glucose test procedure.	7	17.5%	3	82.5%
3- Nurse's level of practice during urine ketone test strip procedure.	37	92.5%	3	7.5%
4- Nurse's level of practice during intra- venous infusion therapy procedure.	18	45%	22	55%
5- Nurse's level of practice during Intravenous insulin infusion via a volume control set procedure.	1	2.5%	39	97.5%
6- Nurse's level of practice during arterial blood gases procedure.	7	17.5%	33	82.5%
7- Nurse's level of practice after care	6	15%	34	85%

Table 3 Shows that 92.5% of nurses had satisfactory level of practice during urine ketone test strip procedure. Meanwhile the nurses had unsatisfactory level of practice during; emergency care on admission, blood glucose test procedure, intra- venous infusion therapy procedure, intravenous insulin infusion via a volume control set procedure, arterial blood gases procedure and after care of patient with DKA (67.5%, 82.5%, 55%, 97.5%, 82.5% and 85%) respectively.

Table (4):Relation between total nurses' knowledge and their demographic characteristics (n=40)

Items	Knowledge				X2 test		
	Satisfactory		Unsatisfactory		X2	P	SIG
	No	%	No	%			
Gender							
Male	1	2.5%	5	12.5%	0.26	> 0.05	NS
Female	9	22.5%	25	62.5%			
Age							
< 30	2	5 %	14	35 %	2.62	> 0.05	NS
30-40	5	12.5%	8	20 %			
40+	3	7.5%	8	20 %			
Level of Education							
Diploma nursing	7	17.5%	22	55.0%	1.77	> 0.05	NS
Technical institute	1	2.5%	6	15.0%			
Bachelor degree	2	5.0%	2	5.0%			
Years of Experience							
< 10	1	2.5%	14	35 %	4.62	> 0.05	NS
10 – 15	3	7.5%	7	17.5%			
15 +	6	15 %	9	22.5%			
Training course regarding DKA							
Yes	3	7.5%	7	17.5%	0.17	> 0.05	NS
No	7	17.5%	23	57.5%			

- p> 0.05 In significant

Regarding relation between total nurses' knowledge and their demographic characteristics Table 4 shows that, there was no statistically significant relation between total nurses' knowledge and gender, age, level of education, years of experience and training course regarding caring of patient with diabetic ketoacidosis (X2= 0.26, 2.62, 1.77, 4.62, 0.17 at p> 0.05 respectively).

Table (5):Relation between total nurses' practice and their demographic characteristics (n=40)

Items	Practice				X2 test		
	Satisfactory		Unsatisfactory		X2	P	SIG
	No	%	No	%			
Gender							
Male	1	2.5%	5	12.5%	0.01	> 0.05	NS
Female	5	12.5%	29	72.5%			
Age							
< 30	2	5 %	14	35 %	0.16	> 0.05	NS
30-40	2	5 %	11	27.5%			
40+	2	5 %	9	22.5%			
Level of Education							
Diploma nursing	6	15.0%	23	57.5%	2.7	> 0.05	NS
Technical institute	0	0 %	7	17.5%			
Bachelor degree	0	0 %	4	10 %			
Years of Experience							
< 5	2	5 %	13	32.5%	0.52	> 0.05	NS
10 – 15	1	2.5%	9	22.5%			
15 +	3	7.5%	12	30 %			
Training course regarding DKA							
Yes	2	5 %	8	20 %	0.26	> 0.05	NS
No	4	10 %	26	65 %			

- $p > 0.05$ Insignificant

Concerning the relation between total nurses' practice and their demographic characteristics; Table 5 shows that, there was no statistically significant relation between total nurses' practice and gender, age, level of education, years of experience and training course regarding caring of patient with diabetic ketoacidosis ($X^2 = 0.01, 0.16, 2.7, 0.52, \& 0.26$ at $p > 0.05$ respectively).

Table (6): Relation between total nurses' knowledge and practice regarding caring of patients with diabetic ketoacidosis (n=40)

Knowledge	Practice				X2 test			R
	Satisfactory		Unsatisfactory		X2	P	SIG	
	No	%	No	%				
Satisfactory	3	7.5%	7	17.5%	2.4	> 0.05	NS	0.24
Unsatisfactory	3	7.5%	27	67.5%				

- $p > 0.05$ Insignificant

Concerning the relation between total nurses' knowledge and practice regarding caring of patients with diabetic ketoacidosis; Table 6 shows that there was no statistically significant relation between overall nurses' knowledge and practice regarding caring of patients with diabetic ketoacidosis ($X^2=2.4$ at $p > 0.05$ respectively).

Discussion

Diabetic ketoacidosis (DKA) may be fatal if not treated quickly and appropriately. Patients with DKA are at risk for complications due to the complexity of the disease, potential for error in fluid, electrolyte, insulin administration and adverse effects of treatment. The emergency nurse has an important role in the monitoring and treatment of the DKA patients. Although DKA represents a complex metabolic imbalance, a systematic approach to fluid resuscitation, insulin administration, electrolyte repletion and monitoring is advantageous to emergency nurses in providing excellent patient care (*Donahey & Folse, 2012*).

Regarding the study of demographic characteristics; the result of the present study revealed that more three quarters of nurses were females. From the researcher point of view; this might be due to elevated number of females working in the nursing field more than males and a reflection of preponderance of women in nursing. Females continue to dominate the profession and men are still a minority among those who practice nursing. This

finding is in confirmity with *Mogre, Ansah, Marfo, & Garti (2015)* who were studied assessing nurses' knowledge levels in the nutritional management of diabetes and reported that, the most of nurses' participant are females.

As regards the age; the finding of this study revealed that two fifth of nurses were less than thirty years old.

The finding of this study is consistent with *Heshmat, Varaei, Salsali, Cheraghi & Tehrani (2013)* who were studied education and implementing evidence-based nursing practice for diabetic patients and found that, most of the studied group ages were less than thirty years. On the other hand, this finding is contradicted with *Teixeira (2011)* who conducted a study about validation of nursing interventions in people with DM and stated that, most of the nurses were more than thirty years.

Concerning level of education; the result of the current study indicated that; about three quarter of nurses had diploma in nursing. This finding is in accordance with *El Sayed (2012)* who conducted a study about assessment of nurses'

performance caring of patient with diabetic foot in Benha university hospitals and revealed that the majority of the studied samples were diploma nurses.

Concerning experience of the nurses, the current study indicated that more than one-quarter of the studied sample had experience between ten to fifteen years. This could be explained as the nature of intensive care units, which necessitates nurses' experience for better quality of care. This result is contradicted with *Alwan & Alhusuny (2014)* who reported that 53.0% of nurses had more than 15 years of experience.

In relation to the previous training course, the current study demonstrated that three quarters of the studied nurses didn't have previous training courses regarding DKA. This might be due to lack of in-service educational training program in the hospital. This result is disagreement with *Uğur, Demir & Akbal(2015)* who carried out a study about postgraduate education needs of nurses who are caregivers for patients with diabetes and found that more than two thirds of studied sample had education course in DM after graduation.

Concerning total nurses' knowledge about all aspects of DKA. The current study revealed that three quarters of the nurses had unsatisfactory level of knowledge regarding caring of patients with DKA. This might be as a result of; shortage of staff nurse, a few training courses about DKA that didn't include all nurses. These findings are in conformity with *Oliveira, Schoeller, Hammerschmidt, Vargas & Girondi (2014)* who studied nursing staff knowledge in relation to complications of DM in emergency services and reported that nurses staff working in the studied adult emergency services should improve their knowledge in relation to how to care of acute complications of DM. On the

other hand; these findings is contradicted with *Trepp, Wille, Wieland & Reinhart (2010)* who conducted a study about diabetes-related knowledge among medical and nursing house staff and reported that nurses have a high level of knowledge about DM.

Concerning total nurses' practice regarding caring of patients with DKA, the present study elicited that more than three quarters of the nurses had unsatisfactory level of practice toward caring of patients with DKA. The reasons for low practice level in the current study might be due to increased number of patients and work load, lack of: in-service training programs, nurses' knowledge which reflects negatively on their practice. This result is in agreement with the study's findings was that of *Maina, Ndegwa, Njenga & Muchemi(2011)* who were studied knowledge, attitude and practice related to diabetes among community members in four provinces in Kenya and reported poor practice of nurses towards diabetes.

As Regard relation between total nurses' knowledge and their demographic characteristics the present study illustrates that there was no statistically significant relation between total nurses' knowledge and their demographic characteristics. This study goes in same line with *El Sayed, Youssef, Alshekhepy & Elfeky (2014)* who were found that there was no statistically significant relation between total nurses' knowledge and their demographic characteristics

The result of this study showed that there was no statistically significant relation between total nurses' practice and their demographic characteristics. This study in accordance with *El Sayedet al. (2014)* who found that there was no statistically significant relation between total nurses' practice and their demographic characteristics.

Concerning relation between total nurses' knowledge and practice this study demonstrated that there was no significant relation between nurses' knowledge and practice; this might be due to lack of supervision, equipment and practice training. This result is in accordance with *El Auoty (2013)* who reported that there were lack of linkage between nurses' knowledge and clinical practice. On other hand, this result is conflict with *Mohamed (2014)* found high statistically significant relation between nurses' knowledge and practice.

Conclusion

Based on the findings of the current study, it can be concluded that, the majority of nurses had unsatisfactory level of knowledge and practice regarding caring of patients with diabetic ketoacidosis. Additionally, the current study revealed that there was no statistically significant relation between nurses' demographic characteristics and total nurses' knowledge & practice. Also, there was no statistically significant relation between total nurses' knowledge and practice.

Recommendations

Based on findings of the current study, the researcher recommends the following:-

- 1- Continuous evaluation of nurses' knowledge and practice is essential to identify nurses' needs and factors affecting their performance in critical care units.
- 2- Close supervision and teaching on spot during work is needed to ensure that quality of care is provided by nursing care of patients with DKA.
- 3- Developing continuous educational programs including evidence based

guidelines based on needs' assessment for nurses to improve their performance and quality of care regarding caring of patients with DKA.

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