

Evaluating Safety Measures Regarding Medication Administration among Staff Nurses



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1.ABSTRACT

Background: Nurses are responsible for ensuring safety and quality of patient care at all times. Many nursing tasks involve a degree of risk such as medication administration procedures carries the greatest risk for patients if staff nurses not follow five rights of medication administration (patient, drug, route, time and dose). **Aim:** the study aimed to evaluate nurses' knowledge and performance about safety measures in medication administration among staff nurses. **Method:** A descriptive correlational research design was utilized; the study was conducted on 350 staff nurses working at Al-Mahalla general hospital. Data was collected by using two tool, Medication Safety Measures Knowledge Assessment Questionnaire. Safe Medication Administration Observation Checklist. **Results:** The study results showed that total nurses' knowledge of safety measures related to medication administration was high level as well as their total performance related to medication administration. **Conclusion:** There was statistically significant correlation between staff nurses' knowledge and their performance of safety measures related to medication administration. **Recommendation:** Provision of adequate supervision and guidance for nurses. Establishing a standard of reward or promotion for nurses who follow the hospital policies related to dealing with medication administration.

Key words: Medication administration, Performance, Safety measures, staff nurses

2.Introduction:

Patient safety issues in primary health care are mainly related to diagnosis and medication. It is generally acknowledged that adverse events related to medication administration account for a significant threat to overall patient safety. Medication administration involves an intricate mixture of various tasks and demands that temporally structure the nurse's workday (Odberg *et al.*, 2017).

Patient safety was defined by the Institute of Medicine (IOM) as the prevention of harm to patients. Emphasis is placed on the system of care delivery that prevents errors, learns from the errors that do occur, and is built on a culture of safety that involves health care professionals, organizations and patients (Dahlke *et al.*, 2017) Safety measures are activities and precautions taken to improve safety as reduce risks related to human health. Medication safety which refer a dockside to bedside medication administration strategy, designed to ensure the right patient, right medication, right dose, right route and right time. Medication Administration as a basic entry level of competency, Safe medication administration requires knowledge of pharmacology, patient assessment, standards and institution policies, skills in various forms administration and judgment around safe medication (Federal Highway Administration, 2012 and Institute Of Medicine, 2013)

Medication administration in health care is a dynamic, interdisciplinary and complex process involving several professional competencies, theoretical knowledge, critical reflection, use of advanced technologies and comprehensive patient participation to ensure high performance on patient safety (Choo, Keohane, Yoon and Dimore, 2010; WHO, 2013)

The accountability of medication administration and safety shared between nurses and health care institute built on the goals of the Institute for Safe Medication Practices, which occurred by approving necessary "7 rights" of medication administration: right patient, right drug, right dose, right time, right route, right education, and the right documentation (Ahmed and El-sol, 2017)

The medication administration process consists of six stages: ordering, prescription, transcribing, dispensing, preparing, administering and finally observing and documenting effects and side effects (Carayon *et al.*, 2014). Medication error (ME) is broadly defined as any error in the prescribing, dispensing or administration of a drug. ME is the single most preventable cause of patient harm (Feleke *et al.*, 2015)

The significant impact of medication administration errors affects patients in terms of morbidity, mortality, adverse drug events, and increased length of hospital stay. It also increases

costs for clinicians and healthcare systems. Due to this, assessing the magnitude and associated factors of medication administration error has a significant contribution for improving the quality of patient care (Feleke et al., 2015)

Despite the advance of new technologies, drug administration remains a complex process related to higher incident rates that can cause adverse events to patients during their hospital stay. Most of the nursing time in clinical wards is estimated to be associated with drug administration, and work overload is a factor that contributes to the occurrence of errors in this process (Magalhães, Kreling, Chaves, Pasin and Castilho et al., 2019).

Hospitals have procedures to minimize the risk of patients being given the wrong medication or wrong dose. Nurses have to check the ID band and the dosage instructions before giving the medication. It is essential not to give the patients any other medication, including herbal supplements or remedies, without the consent of the medical team. Sometimes such medications are not safe to be taken and it could interfere with the medication in which the doctor prescribed (Elsheikh et al., 2017).

At the bedside, the use of bar-code technology to verify a patient's identity and the medication to be administered is a promising strategy for preventing medication errors. This system allowing nurses to automatically document the administration of drugs by means of bar-code scanning with subsequent reduction transcription errors (Poon et al., 2010)

Outpatient care to approximately 3000 patients monthly. AL-Mahalla General Hospital occupied with 200 beds.

The study was conducted at Al-Mahalla general hospital that provide a wide spectrum of health services. It consists of two building; first building consists of three floors which contain Emergency Unit, X-ray Unit, administrative offices and Outpatient Clinics distributed in three floors. Second building composes of four floors, first floor which contain Dialysis Unit and Sterilization Unit. Second floor which contain Operation Rooms, Neonatal Intensive Care Unit and Pediatric department. Third floor which contain Cardiac Care Unit, Orthopedic Department and Surgical Unit. Four floor which contain Obstetric Unit, urology unit and medical units.

3.3. Participant:

Subject of this study included all available staff nurses who are responsible for giving

medication in the predetermined settings during time of data collection. Data was collected when the staff nurses administer medication for their assigned patients, observation doses for medication administration about 350 doses.

3.4. Tools of data collection:

The data of this study were collected by using two tools:

Tool (I): Knowledge about Safe Medication Administration Sheet

This tool developed by Sayed, (2007) to assess nurse's socio-demographic data and knowledge regarding safety measures of medication administration.

It consists of two parts:

Part 1: Personal characteristic:

Such as age, sex, gender, marital status, qualifications and years of experience and previous attendance of training course about patient safety.

Part 2: Medication Safety Measures Knowledge Assessment Questionnaire:

It included 65 items categorized into five dimensions, global standards for patient safety 4 items, information about medication 3 items, writing medication order 5 items, preparation and giving medication 18 item, infection control 5 items and giving medication and calculate its dosages 30 item. Each statement response will be considered as correct knowledge (1) and incorrect knowledge (zero).

Scoring system:

- Poor (<60% of the total score)
- Average (60%-80% of the total score)
- Good (>80% of the total score)

Tool (II): Safe Medication Administration Observation Checklist:

This tool was developed by Hassan, (2001) to assess nurses' performance to safety measures regarding medication administration route. It includes 44 items categorized into four dimensions basic steps of medication administration 26 item, oral medication administration 6 items, intramuscular injection I.M 6 items, and intravenous injection I.V 6 items. Data were collected when the nurse administer medications for their assigned patients, observation doses of medication administration about 350 doses. Each statement response will be considered as done (1) and not done (zero).

Scoring system:

- Low (<60% of the total score)
- Average (60%-80% of the total score)
- High (>80% of the total score)

3.5. Validity:

Data collection tools translated by researcher into Arabic and tested for its content validity and relevance via a panel of five experts from nursing administration department from Faculty of Nursing Mansoura University who reviewed the tools for clarity, relevancy, applicability, comprehensiveness, understanding and ease for implementation and according to their opinions simple modifications were applied.

3.6. Reliability:

The reliability of nurses' knowledge of safety measures related to medication administration was assessed in the current study showing high reliability with the value of cronbach's alpha (88%). Additionally, nurses' performance related to medication administration Questionnaire measured by cronbach's alpha was good (86%) indicating high reliability

3.7. Pilot study:

A pilot study was carried out before starting data collection on 10% of the staff nurses (35) nurse selected randomly to test the clarity and feasibility of the items and whether it was understandable and to calculate the duration required to fill in the tools item by each participant then any necessary modification was done. Data obtained from the pilot study was excluded from the study results.

3.8. Ethical consideration:

A written approval was obtained from the identified setting for data collection through a letter issued from Faculty of Nursing to the director of the hospital.

A verbal consent was obtained from all the participants before collecting any data. Explanation of the study aim in a simple and clear manner was done. All data were considered confidential and not used outside this study purpose. Participants were informed about their right to withdraw from the study at any time without giving any reason

3.9. Data collection

The researcher met the subjects to explain the study purpose and ask for their participation. The researcher met the respondents either individually or groups during morning and afternoon shifts to distribute the data collection sheets to the respondents in their work units and

present during filling to clarify any ambiguity and answer any questions. Data was collected two days per week. The researcher checked each filling questionnaire and ensuring its completeness. Data collection phase was carried out in the period from the beginning of June to the end of August 2020.

3.10. Statistical analysis

The collected data were organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 22, SPSS Inc. Chicago, IL, USA). Categorical variables were represented as frequency and percentage. Continuous variables were represented as mean, and standard deviation. Independent t-test was used to test the difference between two means of continuous variables. ANOVA test used to test the difference between more than two mean of continuous variables. Chi-square test was conducted to test the association between two categorical variables. Pearson correlation coefficient test was conducted to test the association between two continuous variables. Statistically significant was considered as (p-value ≤ 0.01 & 0.05).

4. Results:

Table (1) shows personal characteristic of staff nurses. According to age, more than half (54.3%) of the staff nurses were less than thirty years old. Regarding marital status, high percent (82.9%) of staff nurses were married. As for educational qualification, more than half (54.6%) of staff nurses had bachelor's degree in nursing. In addition, (33.7%) of staff nurses had experience more than four years.

Table (2) shows mean scores of staff nurses' knowledge about safety measures of medication administration for general information about medication was the lowest (2.21 ± 0.76), while mean score of staff nurses' knowledge about safety measures of medication administration for giving and calculating medication dose was the highest (25.86 ± 2.75) mean score.

Table (3) shows the mean scores of staff nurses' performance related safety measures of medication administration and it shows that the average score regarding staff nurses' performance before medication administration was 12.44 ± 1.46 , the average score regarding staff nurses' performance during medication administration was 12.35 ± 1.69 , the average score regarding staff nurses' performance after medication administration was 4.83 ± 1.32 and finally the average score of the overall staff nurses' performance was 29.63 ± 2.76 .

Figure (2) Shows the levels of safety measures of medication administration regarding the included staff nurses. The level of safety measures of medication administration was high levels (75.1%- 52.6%- 69.7%- 67.1%) respectively. before medication administration, during medication administration, after medication administration and overall safety measures.

Table (4) shows the staff Nurses' characteristics in relation to their knowledge and performance related safety measures of medication administration. there is statistically significant relation effect (13.33\0.000) - (2.88\0.004) -

(5.34\0.005)- (5.34\0.005) -(2.35\0.02) -(2.60\0.01) respectively age, gender, level of education, experience years, attending training courses about medication administration and attending courses about patient safety. Except marital status.

Table (5) shows the correlation between nurses' knowledge and their performance of safety measures related medication administration. There was statistically significant correlation between the Total staff nurses' knowledge and the Total staff nurses' performance (P<0.05).

Table (1): Personal characteristics of the studied nurses (n=350)

Variables	No	%
Age years:		
▪ 20-30	190	54.3
▪ 31-40	135	38.6
▪ >40	25	7.1
Mean±SD	31.08±7.19	
Gender		
▪ Male	60	17.1
▪ Female	290	82.9
Marital status		
▪ Single	61	17.4
▪ Married	289	82.6
Level of education		
▪ Diploma degree	78	22.3
▪ Technical degree	81	23.1
▪ Bachelor degree	191	54.6
Experience years:		
▪ 1-5	188	33.7
▪ 6-10	116	33.1
▪ >10	116	33.1
Mean±SD	8.71±5.62	
Attending medication administration training courses		
▪ Yes	8	2.3
▪ No	342	97.7
Attending patient safety training courses		
▪ Yes	28	8.0
▪ No	322	92.0

Table (2): Mean scores of staff nurses' knowledge about safety measures of medication administration (n=350)

Nurses' knowledge about safety measures of medication administration	Noof items	Min– Max	mean± SD	Mean %	Rank
1. Global standards for patient safety	4	0-4.0	3.63±0.54	90.75%	2
2. General information about medication	3	1.0-3.0	2.21±0.76	73.67%	6
3. Writing medication order	5	1.0-5.0	4.07±0.86	81.4%	5
4. Preparation and giving medication	18	7.0-18.0	14.77±2.22	82.05%	4
5. Infection control	5	1.0-5.0	4.54±0.76	90.8%	1
6. Giving, and calculating medication dose	30	12.0-30.0	25.86±2.75	86.2%	3
Overall nurses' knowledge	65	38.0-65.0	55.11±5.27	84.78%	

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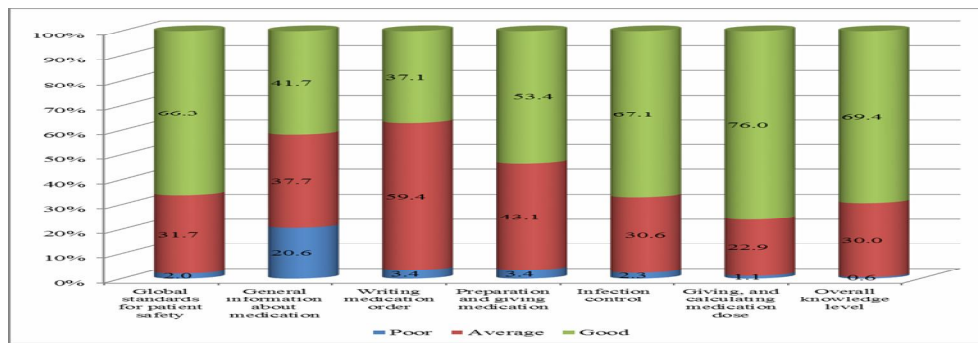


Figure (1) Levels of nurses' knowledge about safety measures of medication administration

Table (3): Mean scores of nurses' performance related safety measures of medication administration (n=350)

Nurses' performance related safety measures of medication administration	No of items	Min - Max	Mean ± SD	Mean percentage	Rank
Before medication administration	14	5.0-14.0	12.44±1.46	88.85%	1
During medication administration	16	7.0-16.0	12.35±1.69	77.18%	3
After medication administration	6	0.0-6.0	4.83±1.32	80.5%	2
Overall nurses' performance	36	19.0-35.0	29.63±2.76	82.30%	

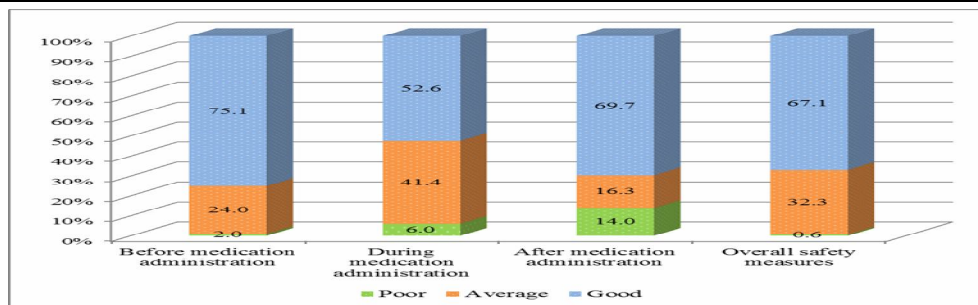


Figure (2): Levels of safety measures of medication administration (n=350)

Table (4): Nurses' characteristics in relation to their knowledge and performance related safety measures of medication administration (n=350).

Variables	Total knowledge score	Total performance score
	Mean±SD	Mean±SD
Age years:	54.03±4.95	29.73±2.60
▪ 20-30		
▪ 31-40	55.89±5.35	29.44±3.02
▪ >40	59.04±4.71	29.92±2.53
f-value/ p-value	13.33/0.000**	0.57/0.56
Gender		
▪ Male	55.88±5.73	30.56±2.48
▪ Female	54.94±5.16	29.44±2.78
t-value/ p-value	1.25/0.21	2.88/0.004*
Marital status		
▪ Single	55.80±5.73	30.16±2.67
▪ Married	54.95±5.17	29.53±2.77
t-value/ p-value	1.14/0.25	1.61/0.11
Level of education		
▪ Diploma degree	54.64 ±5.39	30.39± 2.89
▪ Technical degree	54.48 ±5.27	29.28 ±2.35
▪ bachelor degree	55.56 ±5.20	29.47 ±2.83
f-value/ p value	1.58/0.21	3.98/0.02*
Experience years:		

▪ 1-5	54.06±4.85	29.68±2.69
▪ 6-10	54.98±5.69	29.57±2.76
▪ >10	56.28±5.04	29.64±2.87
f-value/ p value	5.34/0.005**	0.04/0.95
Attending training courses about medication administration		
▪ Yes	55.00±4.92	29.68±2.76
▪ No	55.11±5.28	27.37±2.19
t-value/ p-value	0.06/0.95	2.35/0.02*
Attending training courses about patient safety		
▪ Yes	57.57±5.17	29.39±3.26
▪ No	54.89±5.23	29.65±2.75
t-value/ p-value	2.60/0.01**	0.48/0.62
* Statistically significant (P ≤0.05) / **highly statistically significant (P ≤0.01)		

Table (5): Correlation between nurses’ knowledge and their performance of safety measures related medication administration (n=350)

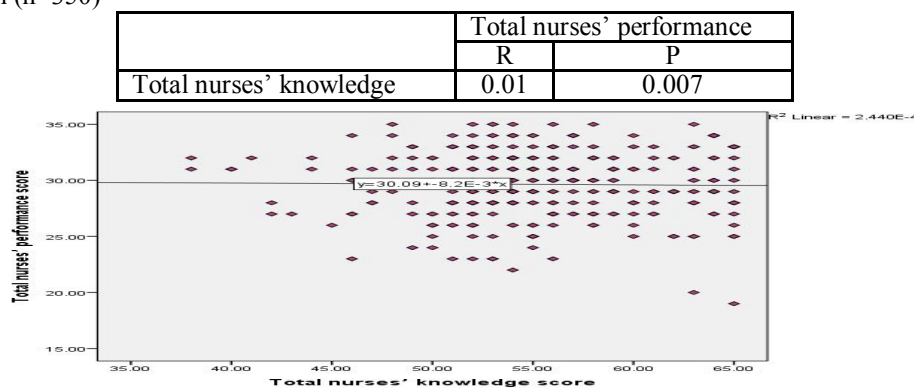


Figure (3): Relationship between nurses’ knowledge and their performance related safety measures of medication administration

5. Discussion:

Medicine administrations should be safe and effective. Nurses should be properly trained to administer the drugs effectively. Nurses also need knowledge about drugs and their actions to reduce problem in medication administration. (Chiarella et al., 2018)

Medication safety is an important issue in which acute care nurses are actively involved on a daily basis. International research highlights that, despite attempts to maintain patient safety during this process, many errors are made (Jheeta and Franklin, 2017). Hence, the current study aimed to evaluate nurses’ knowledge and performance about safety measures in safe medication administration among staff nurses. To achieve the aim of the study the results will be discussed through the following three sections: -

Part I: Nurses’ knowledge about safety measures of medication administration, the present study finding revealed that the most of studied staff nurses had good knowledge level, this may be due to continuous supervision, coaching of staff nurses, and continuous staff development to

staff nurses according to educational needs related to safe medication administration.

These results agreed with Parveen, Affzal, Hussain and Gilani (2019) found that the nurses are well aware from the proper site, route and time of medicine and believed that it is very important for every nurse to know about the proper site, rout and time for administration of parenteral medicine. In harmony with the current study, Zakria, and Mohamed, (2017) have demonstrated that, there was a significant improvement of nurse’s knowledge regarding medication administration following the utilization of six safe practices as well as determination of the frequency of errors and interruption.

It also supported with Eisenhauer et al., (2007); Popescu et al., (2011); Dickson and Flynn (2012) mentioned that nurses play a pivotal role in medication management and safety, which extends beyond a responsibility for just preparing and administering medications as prescribed, nurses coordinate the delivery of care and have the closest interaction with patients, which enables them to assess the patient safety in relation to the medications that are prescribed also identified nurses' clinical reasoning and coordination of care

with physicians and pharmacists as being essential for safe medication administration.

The result disagreed with Al-Jaradi, Haza, and Odhah (2021) who found that nurses had fair level of knowledge related drug administration at public hospitals in Sana'a city Yemen. Abd Elmageed, Soliman and Abdelhamed (2020) also reported slightly less than two thirds of nurses have poor total knowledge score regarding medication administration. Mohammed, Attia and Abdelrahman (2020) found that most of nurses had unsatisfactory knowledge and practice level regarding medications administration.

Zyoud et al., (2019) found that Nurses from multi-specialty hospitals in Palestine have insufficient knowledge about high alert medications among nurses in government hospitals in West Bank, Palestine. In addition, Ebrahim and Elnagar (2016) have demonstrated that the majority of the nurses have limited awareness of medication errors and safety measures to prevent errors before the nursing intervention. The study of Kirubakaran, & Amirtham, (2017) also reported that the studied nurses had a moderate level of knowledge related drug administration.

The present study results also showed that the studied nurses had high levels of knowledge related infection control, patient safety, giving and calculating medication dose, and medication preparation. This may be due to staff nurses follow hospital policy for giving medication, staff nurses well reading therapeutic prescription before giving medication and staff nurses check the expiration date periodically and made a table signed by the person who checked the expiration date.

These results in the same line with Parveen, Affzal, Hussain and Gilani (2019) reported nurses believed that this is very important to wash hand prior to the use of parenteral medicine and were well aware about the proper site, route and time of medicine. Abu Hashish and El-Bialy (2013) recommended that teaching nurses about these issues, infection control measures, improving knowledge about medications through orientation and training program especially for newly hired nurses.

Part II: Nurses' performance about safety measures related to medication administration, the present study finding revealed that the majority of studied staff nurses had high levels of performance before, during and after medication administration. This may be due to staff nurses had adequate performance level related to medication administration by different routes. The

researcher observed that the nurses have good performances in all skills regarding three stages, including pre, during and post administration of medication.

These results agreed with Anwar, Lotfy and Alrashidy (2019) found that the majority of nurses were aware of the importance of safe injection practices to minimize blood borne disease. Kirubakaran, & Amirtham, (2017) found that the nurses were prepared medication and administrated it appropriately and concerned with documentation drug administration.

These findings disagreed with Mohammed, Attia and Abdelrahman (2020) that the majority of the studied subjects had unsatisfactory practice level of medication administration. Parveen, Affzal, Hussain and Gilani (2019) found that there is lack of proper practice related medication administration among nurses at Punjab institute of cardiology Lahore.

It also disagreed with Gunningberg, Pöder, Donaldson & Leo Swenne (2014) reported that the nurses had limited adherence to medication administration fundamental safe practices such as consistent labeling the medication, checking patient name and civic registration number, explaining the medication to the patient and documentation of the medication after preparation. Najma, et al, (2012), who found that, the majority of skill items, the study participants were not following the international standards for preparation and administration of medication, the available guidelines had many gaps as per international standards and were not being properly practiced in the clinical setting.

The present study results showed that safety measures before medication administration by studied staff nurses was at the highest level of performance. This may be due to staff nurses check all equipment before medication administration and perform hands hygiene (wash or disinfect), this may be due to use of detergent tools and running water in every section, as well as disinfectants for hands. So, the nurse wash hands before procedures, and they follow guideline in aseptic techniques and infection control standard as regards hand washing before drug preparation and administration.

This finding accordance with Fahimi, et al (2008) who mentioned that most nurses agree that hand washing and wearing gloves as the most effective measures to control infection. As well as this result agree with, (Hassan, 2001) who mentioned that hand washing is the most important procedure in controlling the spread of germs. Every

member of health care team must wash his hands when arriving to unit, before and after giving direct patient care and handling equipment, food and patient belonging and after using of a tissue or bathroom. This finding disagreed with Abdel-Aziz (2004) who found that, all nurses were not complying with infection control during administration, and they don't follow guidelines in aseptic techniques as regards hand washing before the procedure.

The present study results showed that safety measures after medication administration by studied staff nurses was the lowest mean score of overall nurses' performance. This may be due to, the studied staff dose not discard the disposable equipment according to infection control procedures and staff nurses dose not sign inpatients file after medication administration, this finding in consistent with Rizk (2004)& Reddy, et al (2009) whom mentioned that, inadequate nurses practice may be related to the fact that, the staff nurses had inadequate performance related to the lack of medication supplies as medication cups, alcohol, cotton, disposable gloves and infection control measures.

The present study revealed that nurses' performance related medication administration associated with their education, gender and attending training courses related medication administration. These findings agreed with Devu (2019) who reported there was significant relationship between nurses' practices of medication administration and their professional qualification.

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This result is consistent with Mohamed & Gaber (2010) stated that there was highly statistical relation between total nurses knowledge about safety measures related to medication administration and demographic characteristic regarding age, educational qualification, marital status and years of Experience. These findings disagreed with Mohammed, Attia and Abdelrahman (2020) found that there was no relationship between nurses' practices related medication administration and their demographic characteristics.

The study also revealed that nurses' knowledge related medication administration was associated with their age, experience, and attending training courses related patient safety, this mean that old nurses have more experience and attend training courses, have more Knowledge about medication administration than young age nurses less experience and less training courses. These results agreed with the study of Mohammed, Attia and Abdelrahman (2020) found that there was relationship between nurses' knowledge related medication administration and their education and experience. Devu (2019) found that nurses' knowledge related medication administration associated with their age and experience.

These results disagreed with the study of Kirubakaran, & Amirtham, (2017) that reported there was no significant correlation between knowledge related medication administration and years of experience among staff nurses. Abukhader, & Abukhader (2020) found that educational program on medication safety improves the

knowledge of critical care nurses regarding intravenous medication errors

Part III: Relationship between nurses' knowledge and their performance of safety measures related medication administration

The present study findings indicated that, there was statistically significant correlation between nurses' knowledge and their performance about safety measures related to medication administration. These results in the same line with Abd Elmageed, Soliman, Abdelhamed (2020) found that there was significant relation between nurses' knowledge and their practice regarding medication administration. Devu (2019) found that there was significant relationship between nurses' knowledge and practice related administration of drugs. In addition to the study of TAHA (2014) that reported there was relationship between knowledge and practice of critical care nurses regarding administration total parenteral medication.

These findings disagreed with Mohamed (2007) and Kumar (2011), they found that, in the health care team, the nurse is responsible for medication administration to the patients and is considered as the key faulty component for medication administration errors, and there was no relation between nurses's knowledge, and their performance related to medication administration.

6. Conclusion

From the present study, it was concluded that:

Staff nurses' knowledge about safety measures related to medication administration and staff nurses' performance about safety measures related to medication administration was at high level for more than half of studied staff nurses. In addition, there was statistically significant correlation between staff nurses' knowledge about safety measures related to medication administration and staff nurses' performance about safety measures related to medication administration.

7. Recommendations

Based on the results of this study, it was recommended that:

- The hospitals should establish policies concerning the medication administration and be available at each hospital unit and each nurse should be clearly acquainted with these policies.
- Improving knowledge about medication administration through training programs,

especially in safety measures of infection control and waste management for newly hired nurses.

- Developing protocol for medication administration, which contains checklists about (medication administration), guidelines to prevent errors of medication administration.
- Develop a procedure manual about safety measures related to medication administration.
- Provision of adequate supervision and guidance for nurses.
- Establishing a standard of reward or promotion for nurses who follow the hospital policies related to dealing with medication administration.
- Further research
- Assessing factors affecting nurses' performance regarding medication administration.
- The impact of developed procedure manual regarding medication administration on staff nurses's performance.
- Effect of training program on medication administration for nurses on patient length of stay and infection rate.

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